



## Status Report

# Water Buffalo in the Iraqi Marshes

## Thi Qar and Missan Governorates

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This report is prepared to summarize and inform partner agencies on the status of the buffalo survey initiatives of Nature Iraq. For more information please refer to Nature Iraq's web site: [www.natureiraq.org](http://www.natureiraq.org), write to [info@natureiraq.org](mailto:info@natureiraq.org) or contact our office at:

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## Summary

In May 2006 Nature Iraq conducted a project to study water buffalo in the marshes of three southern Iraqi governorates: Thi Qar, Missan, and Basrah. The goals of this project were to provide needed information regarding the status of buffalo following reflooding of the Mesopotamian marshlands, as well as contribute basic data for future plans and studies. Crucially important was determining whether the southern marshes are headed toward full restoration; indicated by increasing population size of buffalo returning to their favorite natural habitat. To measure buffalo population changes a survey was created, based on a questionnaire submitted to local breeders, which included questions focused mainly on numbers and productivity of the animals. Additionally, photos were taken depicting the buffalo's living and grazing habitat (See Annex 2). The survey was conducted until January 2007, throughout the marshes of Thi Qar and most of Missan (the Basrah survey was deferred).

The survey results demonstrated that the total population of buffalo was 40,008, divided almost equally between the two governorates, however numbers varied widely between individual stations. Of this number, about 83% were female, and approximately 72% of these females were more than two years old, the age of fertility and milk productivity, with relatively equal distribution between the two governorates. The number of lactating cows in Thi Qar was 4,424 heads, producing up to 22,055 liters of milk daily, with milk production per cow ranging between 3-7 liters/day. In Missan, the number of lactating cows was 7,394 heads, producing up to 35,994 liters of milk daily, with milk production per cow ranging between 2-5 liters/day. In conclusion, the number and productivity of buffalo in the southern marsh study area is encouraging, but restoring broader areas of marshland while improving nutritional and veterinary services would yield significantly better results. Furthermore, the marshes are showing signs of recovery, with wide distributions of rich plant-life providing a prime natural habitat for the buffalo.

# INTRODUCTION

## 1. Background

Southern Iraqi marsh desiccation was an environmental disaster that severely impacted a variety of species. Water buffalo, for which the marshes have provided a long-time favorable habitat, were affected by the desiccating process, with additional negative ramifications on economic livelihoods. Drying reduced the number of water buffalo in the marshes, mainly due to their dependence on available water and reeds. Additionally, the buffalo's economic importance forced most breeders to leave the marshes and seek other wetland habitats far from the desiccated areas. However, in 2003 many breeders returned to the marshes after the re-flooding.

No adequate or accurate information existed about the buffalo population in the marshes after the re-flooding (USAID, 2004). Presently, information on numbers of buffalo is of great value due to their high economic importance, as well as their substantial impact on the marsh environment. For instance, water buffalo provide more than five percent of the world's milk. Buffalo milk is used in much the same way as cow's milk, because it is high in fat and total solids, which gives it a rich flavor. Conversely, buffalo cause serious environmental damage globally, which has lead authorities to kill large numbers of these animals and/or remove them from their habitats (Lidga, 1996).

### 1.1 *Types of Buffalo*

According to the UN's Food and Agriculture Organization (FAO) statistics, the total number of buffalo in 2000 was about 185 million worldwide (FAO, 2000). There are two general types of Asian water buffalo, wild and domestic. Wild buffalo estimates are usually hindered by the difficulty of distinguishing between domestic, feral, and truly wild buffalo. Global wild buffalo approximations total almost 4,000 animals and protection is provided in special areas of Bhutan, India, Nepal, and Thailand for parts of this wild population. Unfortunately, the number of wild buffalo continues to decline dramatically, due to interbreeding with domestic and/or feral buffalo, hunting, and habitat loss (IUCN Red List, 2007).

There are two types of domestic Asian buffalo: swamp buffalo (*Bubalus carabanesis*,) found in the eastern half of Asia, and river buffalo (*Bubalus bubalis*,) which are found in the western half of Asia, Egypt, and Europe (IUCN Red List, 2007). *Bubalus bubalis* usually is black or dark gray with curved horns, weighing about 300–1000 kg. Domestication had occurred in the areas of the India sub-continent by the medieval period. Although the Chinese were using buffalo 4,000 years ago, they are neither

mentioned in literature, nor seen in artwork of the ancient Egyptians, Romans, or Greeks, to whom they were apparently unknown. It was not until about 600 A.D. that Arabs brought the animal from Mesopotamia and began moving it westward into the Near East. Later, pilgrims and crusaders returning from the Holy Land in the Middle Ages introduced water buffalo to Europe. Table 1 provides a general idea about the types of buffalo throughout the world (Ligda, 1996), while plates 1, 2, 3, 4, 5, 6, and 7 provide descriptions for each of these species, and additional photos of Iraqi water buffalo can be found in Annex 2.

Table 1: Species of water buffalo currently found globally (Ligda, 1996-A)

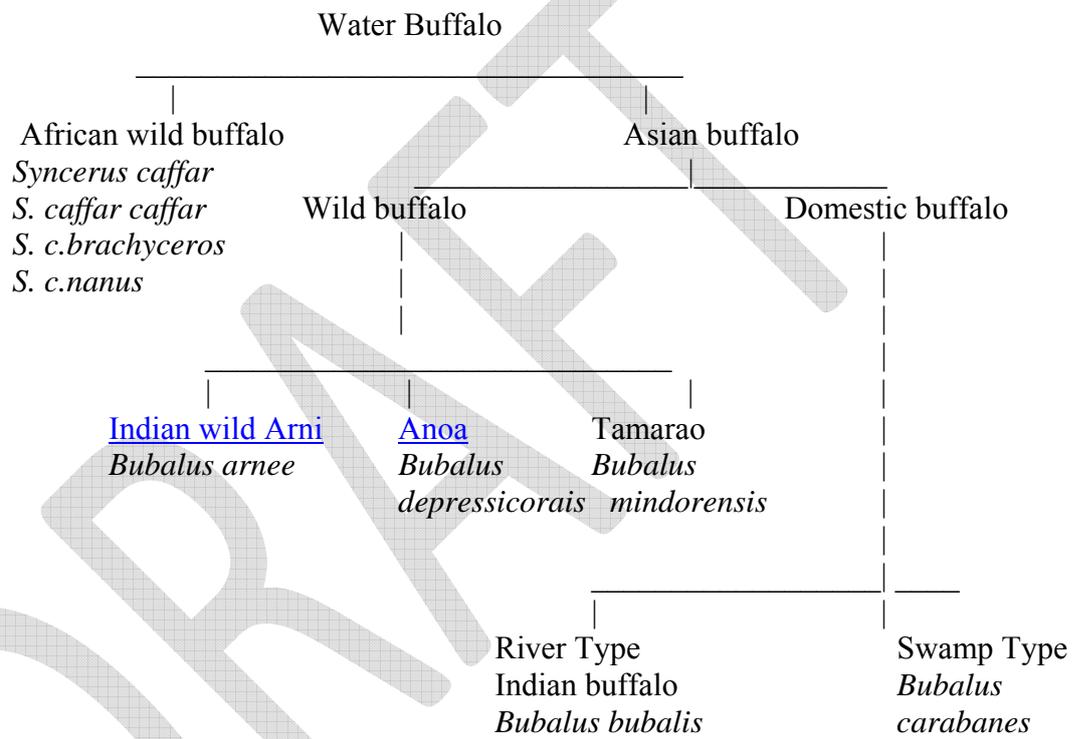


Plate 1: African buffaloes  
Syncerus caffer caffer

Photo by Andrzej Urbaniec (TrekEarth, Retrieved 2007)



Plate 2: Asian buffalo  
Bubalus bubalis in Iraq

Photo by Nature Iraq



Plate 3: African wild buffalo  
*Syncerus caffer nanus* (TrekEarth, Retrieved 2007,  
photographer unknown)

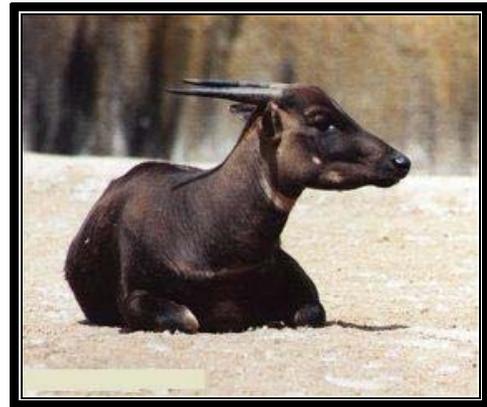


Plate 4: Asian wild buffalo - [Anoa](#)  
*Bubalus depressicorais* (Factsheet, Retrieved 2007,  
photographer unknown)



Plate 5: Swamp Type (Philippines buffalo)  
*Bubalus carabanes* (TrekEarth, Retrieved 2007,  
photographer unknown)



Plate 6: Asian Wild Buffalo – Tamarao  
*Bubalus mindorensis* (Factsheet, Retrieved 2007,  
photographer unknown)



Plate 7: Indian wild Arni, *Bubalus arnee*  
(IUCN- Asian Wild Cattle Specialist Group, Retrieved 2007, photographer unknown)

## 1.2 Iraqi Water Buffalo

Water buffalo are well adapted to swamps and areas subject to flooding. Thus, they are most well suited for the marshes of southern Iraq and the Amazon, the tidal plains near Darwin, Australia, the Pontine

Marshes in south-central Italy, the Orinoco Basin of Venezuela, and other areas.

Two opposing theories exist regarding the origin of buffalo in Iraq. The first theory hypothesizes that wild buffalo already existed in Mesopotamia and spread from there to other countries. Others believe that the buffalo were introduced to the marshes of southern Iraq from India thirteen centuries ago. The taxonomy of the Iraqi southern buffalo is as follows:

**Kingdom:** Animalia

**Phylum:** Cordata

**Class:** Mammalia

**Order:** Artiodactyla

**Family:** Bovidae

Species: *Bubalus bubalis*, Asian type.

Buffalo feed on plants in the marshes and also on protein-rich concentrated food when available. They are large in size and weight, reaching up to 900 kg. The body length is about 115.2-128 cm and the chest girth is 207.2- 223.8 cm. Furthermore, water buffalo are black or gray in color, with white irregularly shaped spots that are sometimes present on the chest, legs or tail. The horns are long, curved toward the back, and the size can be used to determine age. Buffalo's dung is very important as a main source of fuel, however the primary uses are for milk production, meat, and skins.

## 2. Study Sites

The study area covered 85 stations in the southern Iraqi marshes (See Plate 8), of which 42 stations were in Thi Qar governorate (Table 2) and 42 stations in Missan governorates (Table 3). The criterion for selecting a study site was that it be an area inside or near the marsh where buffalo had access for grazing.

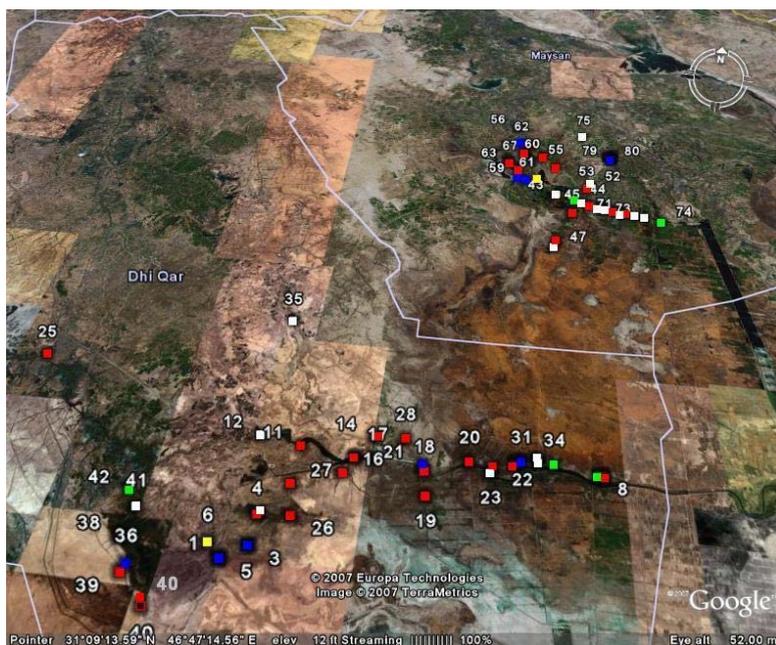


Plate 8: General view of the study Sites: Missan Governorate is to the northeast, while Thi Qar is to the southwest. Eighty-five stations were studied, some of which appear to overlap with others in this image.

Table 2: Stations and coordinates within Thi Qar governorate. Code numbers are used to indicate locations on the maps used in this study.

Thi Qar Governorate				
Site	Monthly Sampling Code	№ of animals (heads)	Coordinates	
			N	E
			° ' "	° ' "
Umm Nakhla (Aal-Zyarah)	1	132	30 48 37.8	46 36 20.1
Al-Amya (Aal-Zyarah)	2	669	30 52 5.4	46 38 29.8
Al-Symadeh	3	73	30 49 41.7	46 38 17.4
Al-Mejereh (Albu Jassim)	4	134	30 51 53	46 38 20.6
Al-Baydha	5	7	30 48 37.1	46 36 21.1
Al-Khowaysah	6	2995	30 49 34.8	46 35 05
Al-Amya		91		
Abul-Naires, Al Chibayish marsh	7	98	30 4 41.7	46 38 17.4
Al-Hisjeh, Al Chibayish marsh	8	1741	30 57 37.3	47 05 50
Al-Sabbaghiya, Al Chibayish marsh	9	147	30 57 42.6	47 06 20.2
Al-Abrat, Al Hammar marsh	10	140	30 57 42.5	47 06 20.4
Al-Jewaiber, Al Hammar marsh	11	170	30 57 30.6	46 40 37.6
Al-Fehood, Al Hammar marsh	12	740	30 58 02.9	46 36 53.8
Al-Fehood/Al-Amayreh, Al Hammar marsh	13	50	30 57 3.5	46 45 28.5
Al-Fehood/Al-Amayreh-Meshlebia, Al Hammar marsh	14	182	30 58 52.5	46 46 46.2

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Thi Qar Governorate				
Site	Monthly Sampling Code	№ of animals (heads)	Coordinates	
			N	E
			° ' "	° ' "
Al-Fehood/Al-Amayreh-Al-Karya, Al Hammar marsh	15	204	30 57 2.3	46 45 21.5
Obadeh region, Al Hammar marsh	16	384	30 55 43.5	46 44 35.7
Aalbu Hemdan, Al Hammar marsh	17	97	30 57 5.7	46 47 16.7
Aalbu Shameh/Aalbu Awedh, Al Hammar marsh	18	280	30 56 30.3	46 51 22.2
Aalbu Shameh/Al-Teeneh, Al Hammar marsh	19	350	30 54 39.2	46 51 40.7
Al-Sadeh/Al-Mewajid, Al Hammar marsh	20	312	30 57 39.3	46 55 6.5
Beni-Hutait, Al Hammar marsh	21	47	30 57 1.0	46 51 11.7
Al-Mewajid/Al-Sharkiyah, Al Hammar marsh	22	215	30 57 28.1	46 57 3.3
Alsaynka/Al-Baher, Al Hammar marsh	23	695	30 56 58	46 56 54.9
Al-Sajeyeh, Al Chibayish marsh	24	984	30 58 13.7	46 59 3.5
Al-Hamedy/Al-Shet, Al Hammar marsh	25	293	31 03 13.9	46 14 31.3
Abu-Ajaj, Al Hammar marsh	26	191	30 52 7.2	46 41 7.3
Al-Hamedy /Aal-Harub, Al Hammar marsh	27	260	30 54 24.9	46 40 29.9
Albu-Shama, Al Hammar marsh	28	146	30 59 0.48	46 49 29.5
Al-Sajeya / Al-Amayra, Al Chibayish marsh	29	573	30 57 55.7	46 59 11.6
Al-Sajeya / Al-Serehat, Al Chibayish marsh	30	306	30 57 52.3	46 58 59.5
Aal-Haj Sari, Al Chibayish marsh	31	96	30 58 07.3	46 59 27.1
Um Bezzuna, Al Chibayish marsh	32	516	30 58 11.9	47 00 55.2
Abu-Sawbat, Al Chibayish marsh	33	523	30 58 33.5	47 00 54.7
Abu-Zirig / Um-Zella / Aal-Attab	34	1110	30 58 8.6	47 02 13.7
Umul wedaa, Al Hammar marsh	35	980	31 09 5.7	46 36 58.2
Al-Khemaysiya, Al Hammar marsh	36	64	30 47 32.1	46 29 18.2
Al-Seheylat, Al Hammar marsh	37	109	30 49 17.7	46 27 51.6
Al-Toweyrat, Al Hammar marsh	38	83	30 49 11.4	46 28 08.5
Al-Heddabiya, Al Hammar marsh	39	162	30 46 55.8	46 29 05.5
Al-Midfar, Al Hammar marsh	40	490	30 45 0.05	46 31 34.1
Al-Nuwashi, Al Hammar marsh	41	913	30 51 26.2	46 28 26.2
Al-Jibeshat, Al Hammar marsh	42	1510	30 52 31.4	46 27 21.2

Table 3: Stations and coordinates within Missan governorate. Code numbers are used to indicate locations on the maps used in this study.

Missan Governorate				
Site	Monthly Sampling Code	№ of animals (heads)	Coordinates	
			N	E
			o ' "	o ' "
Al-Eiz River, Al-Adil Marsh	43	4953	31 28 6.6	47 03 20.8
Al-Eiz River(shaghanba), Al-Adil Marsh	44	1452	31 27 37.4	47 05 21.8
Al-Eiz River(channel # 4), Al-Adil Marsh	45	365	31 25 31.7	47 04 52.8
Al-Eiz River(channel # 12), Al-Adil Marsh	46	311	31 21 28.2	47 03 7.7
Al-Eiz River(channel # 15), Al-Adil Marsh	47	722	31 20 36.2	47 02 46.8
Al-Khaire county/Al – Emsan, Al-Adil Marsh	48	655	31 27 11.4	47 06 0.1
Al-Eiz River/Al-Khair County – central, Al-Adil Marsh	49	330	31 26 51.7	47 06 40.9
Al-Eiz River/Al-Khair county – Beat – fetla, Al-Adil Marsh	50	890	31 26 31	47 08 5.5
Al-Eiz River/Al-Khair county - Nasrulallah, Al-Adil Marsh	51	717	31 26 27.3	47 08 44.9
Aal bu Ali, Al-Adil Marsh	52	796	31 29 49.9	47 07 18.9
Al-Zehraa, Al-Adil Marsh	53	471	31 29 13.6	47 06 45.3
Abu Hutarat, Al-Adil Marsh	54	336	31 35 27.4	47 00 25.5
Al-Jindaleh, Al-Adil Marsh	55	201	31 32 23.1	47 03 15.9
Al-Hereejah, Al-Adil Marsh	56	270	31 38 39.4	46 58 37.2
Al-Turkyah, Al-Selam marsh	57	186	31 33 10.6	46 57 26.5
Umel Edham, Al-Selam marsh	58	54	31 31 59.1	46 58 46.2
Abu Naajeh, Al-Selam marsh	59	21	31 30 15	46 58 45.8
Al-Areedh, Al-Selam marsh	60	54	31 33 3.4	47 00 25.6
Abu Sheha, Al-Selam marsh	61	98	31 29 57.5	46 59 45.9
Bab – Alhewa, Al-Selam marsh	62	23	31 35 58.2	46 59 5.8
Al-Refashiyah, Al-Selam marsh	63	150	31 32 39.2	46 57 44.1
Al-Mudahleb, Al-Selam marsh	64	225	31 31 30	46 58 45.4
Umm Guaydeh, Al-Maymoonah marsh	65	462	31 34 0.7	47 01 44.6
Al-Fehadya/ Maymoona, Al-Selam Marsh	66	223	31 34 19.4	46 59 20
Al-Keromly, Al-Maymoonah marsh	67	145	31 32 28.1	46 57 43.1
Al-Bendeh village/Al-Ashrat, Al-Maymoonah marsh	68	832	31 32 39.8	46 57 34.8
Al-Ferayjat/Albu-Hemeed, Al-Adil Marsh	69	412	31 26 20.4	47 09 35.3
Al-Ferayjat/Bait Bani, Al-Adil Marsh	70	513	31 26 7.9	47 10 27.6
Al- Ferayjat/Aal-Zobat, Al-Adil Marsh	71	310	31 26 3.5	47 11 0.1
Al-Neher/Timeem, Al-Adil Marsh	72	743	31 25 52.3	47 12 4.2
Al-Neher/Al-Seddeh, Al-Adil Marsh	73	979	31 25 36.2	47 13 4.8
Al-Eiz River/Aalbu Haya, Al-Adil Marsh	74	1012	31 25 17.4	47 14 46
Umel Fisheg/Al-Heshriya	75	778	31 37 51.5	47 06 52
Aalbu Arran, Al-Mijar Marsh	76	161	31 34 56.1	47 09 39
Al-Seray/Al-Mijar Center, Al-Mijar Marsh	77	98	31 34 26.9	47 10 7.6
Al-Bedrawi/Al-Mijar Center, Al-Mijar Marsh	78	76	31 34 23.6	47 10 3.6
Al-Ikhlass/Al-Mijar Center, Al-Mijar Marsh	79	110	31 34 17.1	47 09 55.3
Heyel Tenek/Al-Mijar Center, Al-Mijar Marsh	80	88	31 34 14.7	47 09 59.3
Al-Sherka/Al-Mijar Center, Al-Mijar Marsh	81	112	31 35 12.1	47 10 24.9
Al-Jamhuriya/Al-Mijar Center, Al-Mijar Marsh	82	181	31 34 30.3	47 10 10.3
Al-Sinaaeh/Al-Mijar Center, Al-Mijar Marsh	83	87	31 34 48.9	47 10 14.4
Heyel Routha/Al-Mijar Center, Al-Mijar Marsh	84	144	31 34 45.9	47 09 40.4

### 3. Methodology

A team of eight researchers and assistants conducted the water buffalo survey in the three southern Iraqi governorates of Thi Qar, Missan, and Basrah. The survey started in Thi Qar governorate on May 2006 and extended to Missan in October 2006, and by January 2007 was in its final stage. A questionnaire, containing different items focused on buffalo population, milk production, and other aspects life in the study area (see below), was prepared, administered to local breeders, and used to derive the survey. Also, photos of buffalo living and grazing habitats were taken whenever possible.

**"Data Sheet"**

**Water Buffalo in Iraqi Wetlands**

Province:

Marsh name:

Date of visit:

Location name:

Temperature:

Humidity:

GPS coordinates:

	°	'	"
N			
E			

No. of Herds:

Total number of animals:

No. of females:

- a) Age 1 – 2 years:
- b) Age 2 – 3 years:
- c) Age 3 – more years:

No. of Males:

- a) Age 1 – 2 years:
- b) Age 2 – 3 years:
- c) Age 3 – more years:

Milk Production:

- a) No. of lactating cows:
- b) Total milk produced / day:
- c) Average milk produced / cow:

Problems found:

- a) Health
- b) Food
- c) Management
- d) Others

Remarks:

### 4. Results & Discussion

In this section data is described according to the number and distribution of buffalo in the study area, as

well as parameters regarding milk production. *It should be noted that local buffalo breeders provided a large proportion of the information used as the basis for this discussion.*

#### 4.1 Number of Animals (Richness)

Buffalo are known to live in different habitats in Iraq including marshes, villages, and even some urban regions. No current data accurately describes water buffalo numbers in the Iraqi marshlands, especially following the 2003 inundation process. According to a countrywide study focused on different aspects of water buffalo life, numbers decreased from 141,450 heads in 1986 to 98,700 heads in 1993 (Ligda, 1996-B). Another study reported in the early 1990s total buffalo population in Iraq was 200,000, but by 2003 it dropped to 130,000 heads, a 35% decrease (Al Marsomy, 2005). According to the Nature Iraq survey, 40,008 buffalo populate the two governorates of Thi Qar and Missan (See Table 4). A primary goal of this survey is to obtain current data about buffalo numbers in Iraq's southern marshes.

Results obtained to date show 19,262 total buffalo in Thi Qar governorate, distributed among 43 marshland stations. The total population in Missan governorate, throughout its 42 marshland stations, was 20,776 buffalo. The Animal Resources Directorate reported a similar total buffalo population of about 26,500 before desiccation and 16,850 after desiccation in Missan (Al Marsomy, 2005). It should be noted the Missan survey had not been completed by the writing of this status report, although most of the marshlands had been covered.

Table 4. Total numbers of buffalo in Thi Qar and Missan governorates.

Governorate	No. of heads
Thi Qar	19,262
Missan	20,776
Total	40,008

Unfortunately, baseline animal population references, for comparison with present data, have not yet been obtained. However, it can be inferred that buffalo numbers decreased after desiccation. Water buffalo lost their natural habitat and breeders found themselves obligated to move their herds to other regions in the

north. They inhabited several cities and villages along the Euphrates, with some even settling in Baghdad. The reality of population decreases might be worse, especially when the difficult conditions posed by the new dry environment and long trips to find alternative habitats are considered. Literature confirms that buffalo have very little protection from the sun; their sweat glands are one-tenth the density of cattle while their hair coating is correspondingly sparse. Thus, buffalo must not be driven over long distances in the heat of the day; otherwise driving under a hot sun for long hours will cause heat exhaustion and possibly death. Losses can be very high and can occur suddenly (Ligda, 1996-B). These adverse conditions led buffalo numbers in the marshes to decrease dramatically. Conversely, increasing numbers of water buffalo indicate successful steps being taken towards restoration. Most of the breeders returning, increasing animal populations, and restoration of habitat suitable for such growth, indicate the marshes are recovering.

**4.2 Distribution**

The distribution of buffalo among the 85 covered marshland stations was clearly uneven. See Annex 1 for detailed descriptions of numbers in each station. The highest population number for Thi Qar governorate was recorded at Al- Khowaysah, in Hammar Marsh, with a total number of 2,995 head, while for Missan governorate the highest number was recorded at Al- Eiz River, in Adil Marsh, with a total number of 4,953 buffalo. The next highest population (1,741 head) was recorded at Al-Hisjeh located in Chubayish, Central Marsh, and Al-Jibeshat in Hammar Marsh within Thi Qar governorate (Figure 1). The lowest population numbers (with only seven buffalo) occurred in Thi Qar governorate at Al-Baydha, while in Missan governorate only twenty-one buffalo were recorded in Abu Na’ajeh, Al-Selam Marsh (Annex 1).

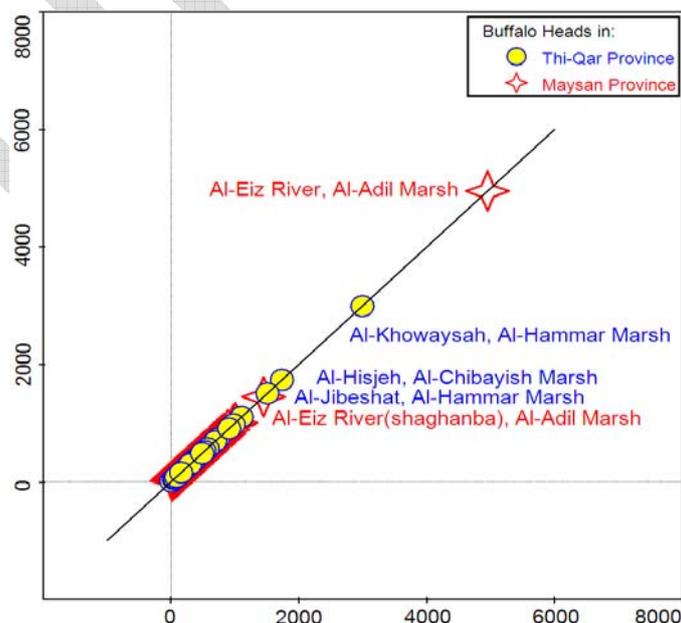


Figure 1: Buffalo distribution in the stations studied within Thi Qar and Missan governorates.

As seen in Figure 1, except for the two high population extremes in Al-Eiz River and Al-Khowaysah, the distribution pattern is highly similar throughout both governorates and their stations. Both governorates contained stations with low, medium, and high populations of water buffalo. However, factors affecting the size of population varied between locations. For Al-Eiz River, the high number of animals was mainly attributed to the large population of buffalo breeders who returned after inundation, in addition to the many people who stayed and used the Al-Eiz River water during the period of desiccation. After inundation, in addition to local people who returned, many breeders from other locations arrived finding a better environment for their families and animals. Elements allowing for this improved quality of life included the presence of reverse osmosis units to provide a clean water supply, dams for raising marsh water levels, and relatives from the same tribe living in the area. These factors, in addition to others such as the size of the original or the newly inundated marsh and the provision of other basic services contributed to the high numbers of buffalo present in these highly populated areas.

On the other hand, factors that contributed to low buffalo populations in the two governorates included: the small size of an inundated marsh area, an unhealthy environment for the animals leading to high mortality due to diseases such as brucellosis, and/or the lack of simple basic necessities of life for humans. Plates 9 and 10 show the distribution of water buffalo in the two governorates.

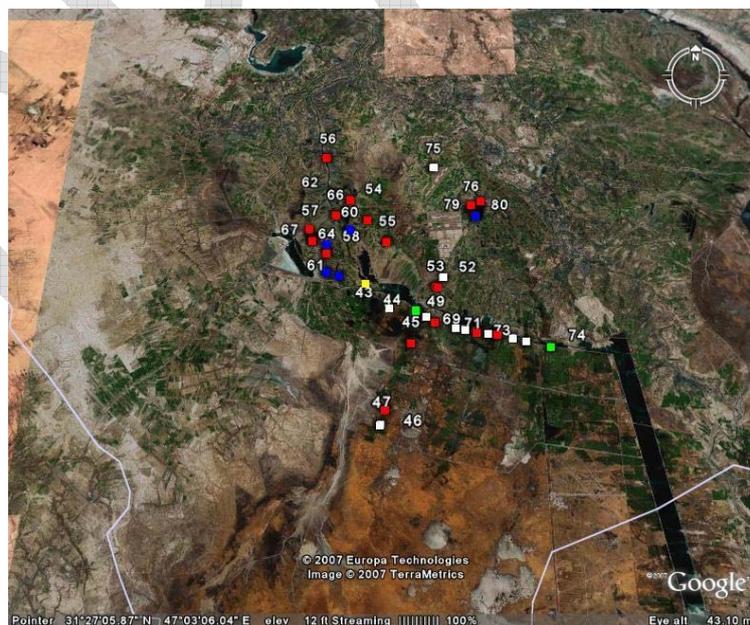


Plate 9: Number and distribution of water buffalo in the marshlands of Thi Qar governorate. Each number indicates a station as arranged in the table. The dot colors express the range of buffalo numbers in the station, as follows: Blue: 1-100; Red: 101-500; White: 501-1000; Green: 1001-2000, and Yellow: 2001-5000

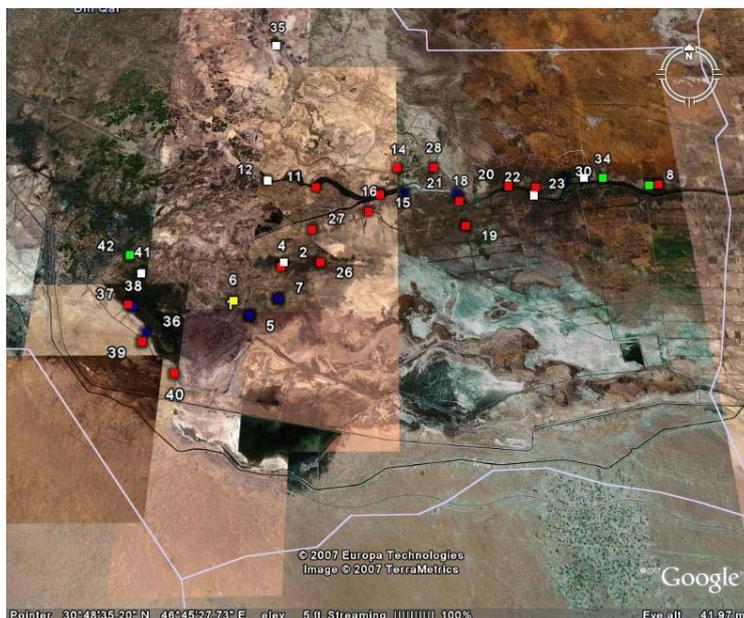


Plate 10: Number and distribution of water buffalo in the marshlands of Missan governorate. Each number indicates a station as arranged in the table. Dot colors express the range of buffalo numbers in the station, as follows: Blue: 1-100; Red: 101-500; White: 501-1000; Green: 1001-2000; Yellow: 2001-5000

Note: Some stations are located very close to each other. Thus, some numbers that indicate certain stations are not shown as they are covered by others.

#### 4.3 Number and Distribution of Lactating Cows

During the survey, it was observed that the number of animals per herd varied widely, ranging from 5 to 50 in some cases. Most of the herd consisted of females (cows), while breeders tended to keep only one male (bull) in each herd for reproduction purposes. Breeders make use of the high milk productivity and fertility of cows. They sell much of the milk and/or milk products daily, while limiting family consumption. This study showed females constitute about 84% (more than 16,000 head) of the total buffalo in Thi Qar, and about 82% (more than 20,500 head) of the total population in Missan.

Herds differed in the number of adult lactating cows, but this was common in the stations studied. As seen in Figure 2 below, the number and distribution of lactating cows follows the same pattern as buffalo genders in the two governorates. Al-Eiz River in Missan and Al-Khowaysah in Thi Qar have the largest numbers of lactating cows among the 85 stations studied (1,181 and 1,710 respectively, see Figure 2 and Annex 1.) This is logical considering the total number of buffalo is larger in these two stations and since females constitute the majority in each herd.

Key determinates of lactating cows in each herd and station are the number of female buffalos at lactation age and the type of nutrition they receive. The age of reproduction, hence lactation, for cows in

the present study is about two years, however this can occur earlier if the animals receive a nutritious diet that includes concentrated food rich with proteins (Dobson & Kamonpatana, 1986). If local plants are the only source of food, the age of lactation could be delayed up to three years. Cows continue producing milk until 8-10 years old; the average age is about 10 years, but some cases of 15 years were recorded. Data collected during the present study has shown that about 75% of cows in Thi Qar are more than 2 years old; the percentage in Missan, approximately 69%, is relatively less. The percentage at Al-Khowaysah station is about 30%, while at Al- Eiz River station it is about 70%. The lower percentage at Al-Khowaysah reflects the fact that most of the cows are younger than two years, but the number of lactating cows is still higher than other stations due to the large female population. The highest percentage of lactating cows at Al-Eiz River is due to most of the cows being older than two years, in addition to the higher female population. However, the number of cows over two years old does not necessarily reflect the number of lactating cows, since some of the cows are probably not fertile. Nonetheless, such numbers reflect the potential for population increases and/or stable fertility and milk productivity levels. Nature Iraq's data suggests good potential for buffalo herds in the study area, but this could change in the future, given the different female age levels, such as in Al- Khowaysah and Al-Eiz River.

The postpartum period is also strongly correlated to the type of food the cow receives. When concentrated foods in addition to plants are received, the postpartum period is about 40 days (Ligda, 1996-A), after which the cow can be bred again and reproduce, fostering both the new and the old calves simultaneously. If concentrated food is not available, this period can extend to one year; this was the case for many cows in the present study.

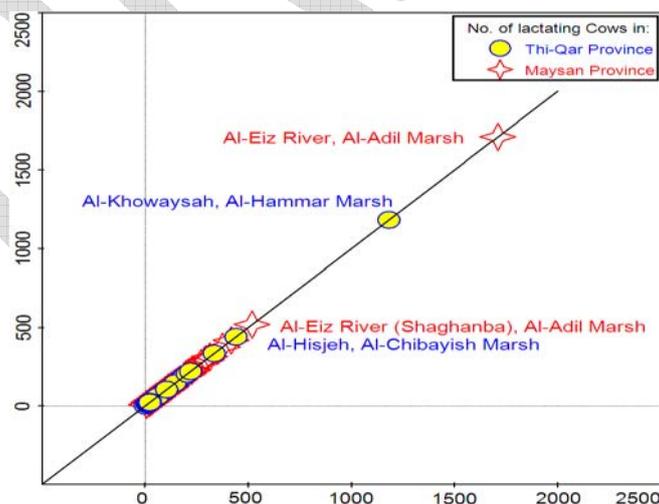


Figure 2: Number of lactating cows in the stations studied within the Marshlands of Thi Qar and Missan.

4.4 Milk Production per Cow

Figure 3 shows milk production per cow (liter/cow/day), obtained by direct questioning of the breeders. The highest mean production was recorded in Al-Midfar and Al-Heddabiya stations in Hammar Marsh, Thi Qar governorate (six liters/cow/day.) The amount of milk produced is correlated to the type of food provided. Cows feeding only on plants hardly produce enough milk to foster their calves. The amount of milk produced was as low as two liters/cow/day in some stations in Thi Qar governorate, where plants were the only source of food submitted to the lactating cows. Conversely, the amount was as high as seven liters/cow/day in the two afore mentioned stations within Hammar Marsh, where breeders had occasional chances to feed their cows concentrated food. It should be noted, when this kind of high-protein content food is available breeders tend to keep it for their lactating cows, but even in the best cases, the amount of milk produced per cow is still low. Such relatively low milk production cannot be attributed definitely to the genetic potential for the Iraqi buffalo, since much of the genetic potential is known to be obscured by environmental influences. For example, for many breeds and types of buffalo the genetic variations in milk yield cannot be accurately determined because they are overwhelmed by the effects of inadequate nutrition and management (Speedy & Sancoucy, Eds., 1989). This was confirmed by the local breeders in the marshes who stated that milk production could be much higher, reaching up to 12 liters/cow/day, when good nutrition is available on a constant basis.

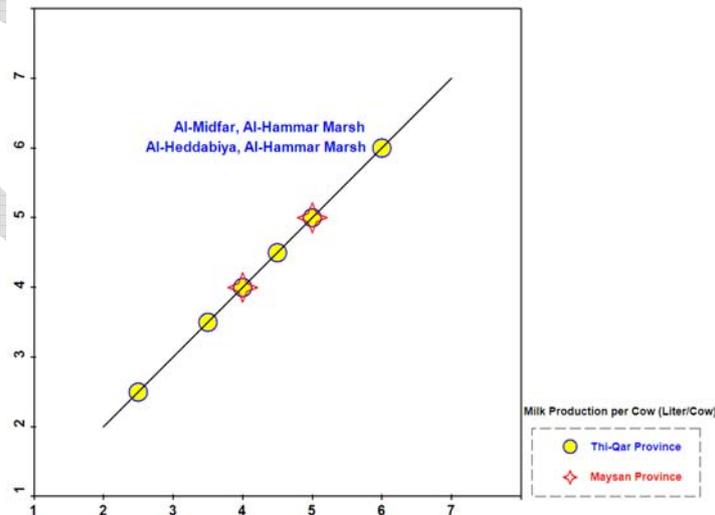


Figure 3: Milk production per cow in the marshlands of Thi Qar and Missan.

4.5 Milk Production (liter/station/day)

Milk production (liter/day) for each station was calculated through multiplying the number of lactating cows by the amount of milk produced per cow in that station. A similar pattern for milk production was observed (Figure 4), with extreme high values recorded in Al-Khowaysah (3,543-5,905 L/day) and Al-Eiz River (8,550 L/day) and lower values in the other stations within the two governorates. Detailed data of milk production for each station is provided in Annex 1. The stations with the highest levels of daily milk production are not among those stations with the highest levels of milk production per cow. The limiting factor here is the other parameter of the equation, the number of lactating cows, which was higher in these two stations. On the contrary, stations with higher levels of milk production per cow, Al-Midfar and Al-Heddabiya, were not among the stations with highest levels of daily milk production. This can be explained by the fairly low number of lactating cows, compared to Al-Eiz River and Al-Khowaysah (see Annex 1).

Generally, the total volume of milk production in the 85 stations studied was about 58,000 Liters. Multiplying this number by the specific gravity of buffalo milk (1.031) indicates there is approximately 60 tons daily and 21,900 tons annually of produced milk. Actually, annual production is most likely less than estimated since cows do not lactate year-round. In India, as a comparison, annual milk production reached 22 million tons in 1988, with a total population of 76 million heads (Speedy & Sansoucy, Eds., 1989).

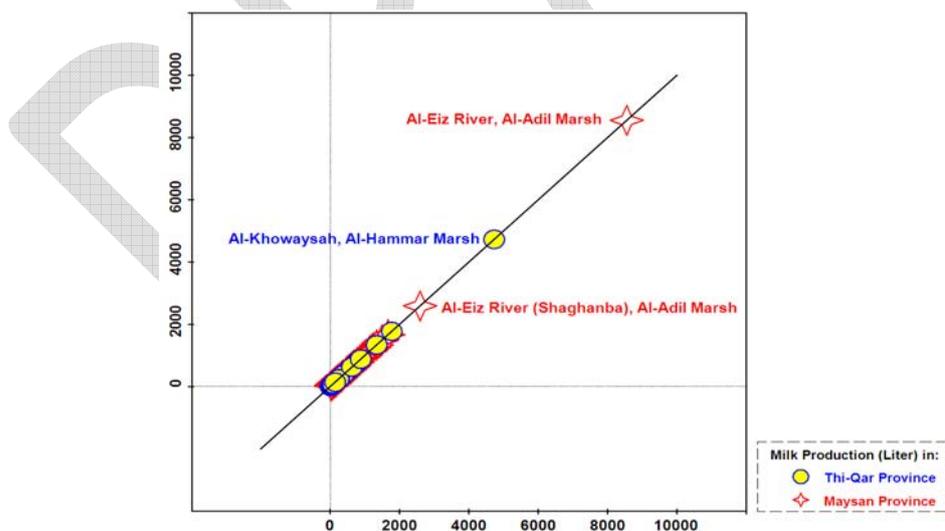


Figure 4: Daily Milk production for the stations studied within the marshlands of Thi Qar and Missan.

## 5. Conclusions

Four main conclusions have been reached as a result of this study:

1. Buffalo population increased in the study area after re-flooding, reaching numbers higher than after desiccation and potentially close to those numbers recorded before desiccation. This is an indicator of good marsh recovery at least in terms of livestock. No significant differences were recorded in the numbers of buffalo between the two governorates of Thi Qar and Missan.
2. Though the distribution between the two governorates is roughly even, the distribution of buffalo was obviously uneven among the stations studied. The highest number for Thi Qar Governorate was recorded at Al-Khowaysah, in Hammar Marsh, while for Missan governorate it was recorded at Al- Eiz River, in Al-Adil Marsh. Distribution was dependent on different factors, with the size of the restored marsh being the most important variable.
3. Females constitute about 83% of the total number of buffalo in the study area. The number and distribution of lactating cows varied between the different stations, with the highest numbers being recorded in the same two stations listed above for Thi Qar and Missan governorates. Milk productivity per cow was low in all stations, reaching a highest value of six (6) liters/cow/day in Hammar Marsh, Thi Qar Governorate. The limiting factor, which could increase this value up to 15 liters/cow/day, is the provision of concentrated food for the lactating cows.
4. A complete view of the buffalo in the marshes of southern Iraq could be reached with the completion of an additional survey that includes the governorate of Basrah.

## 6. Recommendations

Currently, provision of concentrated foods and veterinary services is a top and urgent priority for Iraqi buffalo breeders. Taking these steps will definitely result in significant buffalo population and productivity increases. The next step is the construction of modern complexes in carefully selected areas, which can include dairy production facilities and forage plants in addition to veterinary centers. These infrastructure developments, along with the provision of better local healthcare and education, will yield productive, self-dependent, educated and healthy small communities distributed along the southern marshes in the future. A cooperative, multi-disciplinary approach is needed to achieve such a goal and additional studies will be required to support better planning.

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## Acknowledgement

The team would like to express its gratitude to the local people in the study area for their generous hospitality and cooperation. We hope that this study can contribute in achieving the dreams of these communities.

DRAFT

## Annex 1: Raw Data on Water Buffalo in Thi Qar & Missan Governorates

Buffalo Raw Data (May 2006-until now)								
Province	Site	Monthly Sampling Code	№ of animals (heads)	№ of lactating cows	Milk production (Liter)		Milk production (Liter/cow)	
			Heads	LC	M min	M max	M/C min	M/C max
Thi-Qar	Umm Nakhla (Aal-Zyarah)	m6UNAZ	132	42	84	126	2	3
	Al-Amya (Aal-Zyarah)	m6AAAZ	669	171	513	1026	3	6
	Al-Symadeh	m6AS	73	15	30	45	2	3
	Al-Mejereh (Albu Jassim)	m6AMAJ	134	34	68	102	2	3
	Al-Baydha	m6AB	7	1	3	5	3	5
	Al-Khowaysah	m6AK	2995	1181	3543	5905	3	5
	Al-Amya	m6AA	91	18	36	90	2	5
	Abul-Naires, Al Chibayish marsh	j6ANc	98	23	69	115	3	5
	Al-Hisjeh, Al Chibayish marsh	j6AHc	1741	441	1323	2225	3	5
	Al-Sabbaghiya, Al Chibayish marsh	j6ASc	147	29	87	145	3	5
	Al-Abrat, Al Hammar marsh	j6AAh	140	27	81	135	3	5
	Al-Jewaiber, Al Hammar marsh	j6AJh	170	31	93	153	3	5
	Al-Fehood, Al Hammar marsh	j6AFh	740	95	285	475	3	5
	Al-Fehood/Al-Amayreh, Al Hammar marsh	G6AFAAh	50	9	18	27	2	3
	Al-Fehood/Al-Amayreh-Meshlebia, Al Hammar marsh	G6AFAAMh	182	63	126	189	2	3
	Al-Fehood/Al-Amayreh-Al-Karya, Al Hammar marsh	G6AFAAKh	204	91	182	273	2	3
	Obadeh region, Al Hammar marsh	G6ORh	384	88	264	440	3	5
	Aalbu Hemdan, Al Hammar marsh	G6AHh	97	18	54	90	2	3
	Aalbu Shameh/Aalbu Awedh, Al Hammar marsh	G6ASAAh	280	36	108	180	3	5
	Aalbu Shameh/Al-Teeneh, Al Hammar marsh	G6ASATh	350	64	192	320	3	5
	Al-Sadeh/Al-Mewajid, Al Hammar marsh	G6ASAMh	312	37	111	185	3	5
	Beni-Hutait, Al Hammar marsh	G6BHh	47	18	54	90	3	5
	Al-Mewajid/Al-Sharkiyah, Al Hammar marsh	G6AMASh	215	33	99	165	3	5
	Alsaynka/Al-Baher, Al Hammar marsh	G6ASABh	695	140	420	700	3	5
	Al-Sajeyeh, Al Chibayish marsh	G6ASc	984	189	567	945	3	5

Buffalo Raw Data (May 2006-until now)								
Province	Site	Monthly Sampling Code	№ of animals (heads)	№ of lactating cows	Milk production (Liter)		Milk production (Liter/cow)	
			Heads	LC	M min	M max	M/C min	M/C max
	Al-Hamedy/Al-Shet, Al Hammar marsh	a6AHASH	293	52	156	260	3	5
	Abu-Ajaj, Al Hammar marsh	a6AAh	191	32	96	160	3	5
	Al-Hamedy /Aal-Harub, Al Hammar marsh	a6AHAHh	260	37	111	185	3	5
	Albu-Shama, Al Hammar marsh	a6ASh	146	26	78	130	3	5
	Al-Sajeya / Al-Amayra, Al Chibayish marsh	a6ASAAc	573	92	270	460	3	5
	Al-Sajeya / Al-Serehat, Al Chibayish marsh	a6ASASc	306	63	189	315	3	5
	Aal-Haj Sari, Al Chibayish marsh	a6AHSc	96	13	39	65	3	5
	Um Bezzuna, Al Chibayish marsh	a6UBc	516	61	183	305	3	5
	Abu-Sawbat, Al Chibayish marsh	a6ASc	523	62	186	310	3	5
	Abu-Zirig / Um-Zella / Aal-Attab	a6AZUZAA	1110	145	725	725	5	5
	Umul wedaa, Al Hammar marsh	a6UWh	980	203	609	1015	3	5
	Al-Khemaysiya, Al Hammar marsh	a6AKh	64	17	51	85	3	5
	Al-Seheylat, Al Hammar marsh	a6ASh	109	25	75	125	3	5
	Al-Toweyrat, Al Hammar marsh	a6ATh	83	20	60	100	3	5
	Al-Heddabiya, Al Hammar marsh	a6AHh	162	23	115	161	5	7
	Al-Midfar, Al Hammar marsh	a6AMh	490	104	520	728	5	7
	Al-Nuwashi, Al Hammar marsh	a6ANh	913	220	660	1100	3	5
	Al-Jibeshat, Al Hammar marsh	a6AJh	1510	335	1005	1675	3	5
		<b>T Total</b>	<b>19262</b>	<b>4424</b>	<b>13538</b>	<b>22055</b>		
Missan	Al-Eiz River, Al-Adil Marsh	S6ea	4953	1710	8550	8550	5	5
	Al-Eiz River(shaghanba), Al-Adil Marsh	S6eSa	1452	518	2590	2590	5	5
	Al-Eiz River(channel # 4), Al-Adil Marsh	S6eC4a	365	129	645	645	5	5
	Al-Eiz River(channel # 12), Al-Adil Marsh	S6eC12a	311	117	585	585	5	5
	Al-Eiz River(channel # 15), Al-Adil Marsh	S6eC15a	722	225	1125	1125	5	5
	Al-Khaire county/Al – Emshan, Al-Adil Marsh	S6AKAEa	655	187	935	935	5	5
	Al-Eiz River/Al-Khair County – central, Al-Adil Marsh	S6eAKCa	330	123	615	615	5	5
	Al-Eiz River/Al-Khair county – Beat – fetla, Al-Adil Marsh	S6eAKCFa	890	297	1485	1485	5	5
	Al-Eiz River/Al-Khair county - Nasrulallah, Al-Adil Marsh	S6eAKCNa	717	232	1160	1160	5	5

## NATURE IRAQ STATUS REPORT

Buffalo Raw Data (May 2006-until now)								
Province	Site	Monthly Sampling Code	№ of animals (heads)	№ of lactating cows	Milk production (Liter)		Milk production (Liter/cow)	
			Heads	LC	M min	M max	M/C min	M/C max
	Aal bu Ali, Al-Adil Marsh	N6ABAa	796	314	942	1570	3	5
	Al-Zehraa, Al-Adil Marsh	N6AZa	471	114	342	570	3	5
	Abu Hutarat, Al-Adil Marsh	N6ABHa	336	96	288	485	3	5
	Al-Jindaleh, Al-Adil Marsh	N6AJa	201	76	228	380	3	5
	Al-Hereejah, Al-Adil Marsh	N6AHa	270	94	282	470	3	5
	Al-Turkyah, Al-Selam marsh	N6ATs	186	56	168	280	3	5
	Umel Edham, Al-Selam marsh	N6UEs	54	19	57	95	3	5
	Abu Naajeh, Al-Selam marsh	N6ANs	21	8	24	40	3	5
	Al-Areedh, Al-Selam marsh	N6AAs	54	21	63	105	3	5
	Abu Sheha, Al-Selam marsh	N6ASs	98	37	111	185	3	5
	Bab – Alhewa, Al-Selam marsh	N6BAAs	23	7	21	35	3	5
	Al-Refashiyah, Al-Selam marsh	N6ARs	150	59	177	295	3	5
	Al-Mudahleb, Al-Selam marsh	N6AMs	225	81	243	405	3	5
	Umm Guaydeh, Al-Maymoonah marsh	N6UGm	462	196	588	980	3	5
	Al-Fehadya/ Maymoona, Al-Selam Marsh	D6AFMs	223	89	267	445	3	5
	Al-Keromly, Al-Maymoonah marsh	D6AKm	145	59	177	295	3	5
	Al-Bendeh village/Al-Ashrat, Al-Maymoonah marsh	D6ABAAm	832	287	875	1435	3	5
	Al-Ferayjat/Albu-Hemeed, Al-Adil Marsh	D6AFAHa	412	159	447	795	3	5
	Al-Ferayjat/Bait Bani, Al-Adil Marsh	D6AFBBa	513	169	507	845	3	5
	Al-Ferayjat/Aal-Zobat, Al-Adil Marsh	D6AFAZa	310	123	369	615	3	5
	Al-Neher/Timeem, Al-Adil Marsh	D6ANTa	743	288	864	1440	3	5
	Al-Neher/Al-Seddeh, Al-Adil Marsh	D6ANASa	979	375	1125	1875	3	5
	Al-Eiz River/Aalbu Haya, Al-Adil Marsh	J7eAHa	1012	417	1251	2085	3	5
	Umel Fisheg/Al-Heshriya	J7UFAH	778	289	867	1445	3	5
	Aalbu Arran, Al-Mijar Marsh	J7AAM	161	59	295	177	3	5
	Al-Seray/Al-Mijar Center, Al-Mijar Marsh	J7ASm	98	35	165	105	3	5
	Al-Bedrawi/Al-Mijar Center, Al-Mijar Marsh	J7ABm	76	26	130	78	3	5
	Al-Ikhlass/Al-Mijar Center, Al-Mijar Marsh	J7AIm	110	37	185	111	3	5

Buffalo Raw Data (May 2006-until now)								
Province	Site	Monthly Sampling Code	№ of animals (heads)	№ of lactating cows	Milk production (Liter)		Milk production (Liter/cow)	
			Heads	LC	M min	M max	M/C min	M/C max
	Heyel Tenek/Al-Mijar Center, Al-Mijar Marsh	J7HTm	88	29	145	87	3	5
	Al-Sherka/Al-Mijar Center, Al-Mijar Marsh	J7AShm	112	41	205	123	3	5
	Al-Jamhuriya/Al-Mijar Center, Al-Mijar Marsh	J7AJm	181	66	330	198	3	5
	Al-Sinaaeh/Al-Mijar Center, Al-Mijar Marsh	J7ASim	87	31	155	93	3	5
	Heyel Routha/Al-Mijar Center, Al-Mijar Marsh	J7HRm	144	54	270	162	3	5
		M Total	20746	7349	29853	35994		
		Total	40008	11773	43391	58049		

## Annex 2: Photos for Iraqi Buffalo (all photos by Nature Iraq)

### Shape and Size



Black Bull



Black Buffalo, calf and other adults



White-spotted buffalo



White-spotted leg and tail buffalo



Buffalo's Calf



Calf in the Stable

**Habitat**



Buffalo in the stable



In the Marsh



Crossing the river with the breeders

**Malnutrition**



**In the Herd (on the way to the marsh)**



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