

A Preliminary Study of the Ecology of Wadi Hanifah Stream with Reference to Animal Communities

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ABSTRACT. A preliminary ecological investigation of Wadi Hanifah stream revealed the presence of a permanent stream flowing from north (Badiyah) to south (south-east of Al-Hair city) covering a distance of about 50 km. The main sources of stream water are sewage effluents, agricultural runoff and pumped shallow ground water from Arriyadh city. The effects of sewage pollution were apparent from sampling stations 10 to 13. Thereafter, the quality of stream water improved. A luxuriant growth of reed plant and *Typha domingensis* has taken place along the margin of the stream. Seven introduced fish species have established breeding populations in the stream. Three species of snails were recorded. Marsh frog was common. Other invertebrate fauna comprising insects, crustaceans, rotifers, annelid worms, free living nematodes and protozoans were poor. Twenty two species of migratory birds were recorded.

Wadi Hanifah extends from north of Al-Uyaynah to the south of Al-Hair city with a maximum length of the catchment area of about 110 km and the widest part being 40 km (Fig. 1). The catchment area can be divided into four major areas. (1) The north upper reaches of the wadi extending from Al-Uyaynah to Al-Ilb Dam. In this area there are agricultural lands and farming villages. (2) Al-Ilb Dam to Masani lakes is an area of urban development and agricultural activities. (3) Masani lakes to the southern part of the wadi drains lands with extensive agricultural activity. To the south-east of Al-Hair city shallow expanses of water have formed. (4) The side wadis and plateau land comprising the open desert and forms the largest component of the catchment area.

The main wadi flood-channel is slightly east of the center of the catchment area and flows from northwest to southeast. Prior to extensive urban activity the source of water to the main channel was seasonal rain providing seasonal water in the channel. However, during the last few decades considerable urban and agricultural development has taken place in the catchment area, and this has led to considerable disposal of sewage effluent and agricultural runoff. Most of the Arriyadh city is located in the wadi catchment area (Fig. 1). Since 1950 Arriyadh population has doubled every decade, and has exerted considerable pressure on the wadi for land and water use. As a result, considerable amount of sewage effluent, treated and untreated, is released daily into the wadi main channel. Because of increased consumption and disposal of water, the ground water table has risen which sometimes causes local seepage. The surface water is pumped and drained to lower the water table providing a continuous source of water to the wadi. This has resulted in the formation of a permanent stream flowing downstream of Badiyah. According to an Arriyadh Development Authority (ADA) study about 100,000,000 m³ of water is potentially available annually as waste water (ADA 1990). As the source of water in the Wadi Hanifah is mainly from the sewage treatment plant, untreated sewage, septic-tanks, agricultural runoff, and pumped shallow ground water, the stream water is liable to be polluted. The quality of the water improves as the distance from the source of pollution increases because of self purification.

Alongwith the establishment of a permanent flow of water a luxuriant flora has developed in the main channel and on the banks of the stream. Some wetlands with extensive growth of reed plant have also developed along the course of the stream. A rich fauna appears to have developed. A population of exotic tilapia fish has also become established in the water channel. Being a prolific breeder, it is found in large numbers in lakes and in those areas where the flow of water is moderate. Until now little information is available on the ecology of Wadi Hanifah stream, though a comprehensive Wadi Hanifah Development Plan has been prepared by Arriyadh Development Authority (ADA 1990). The National Wild Life Commission has also been carrying out a systematic study of birds in Al-Hair lakes for the last few years. The present study was undertaken to make a preliminary investigation on the ecology of Wadi Hanifah stream and its animal communities. The results of this study are reported here.

Materials and Methods

Along the 50 km length of Wadi Hanifah stream 15 sampling stations were established (Fig. 1). A brief description of the sampling stations is provided. These stations were visited on 7 days between 4 to 12 December, 1993, and three times

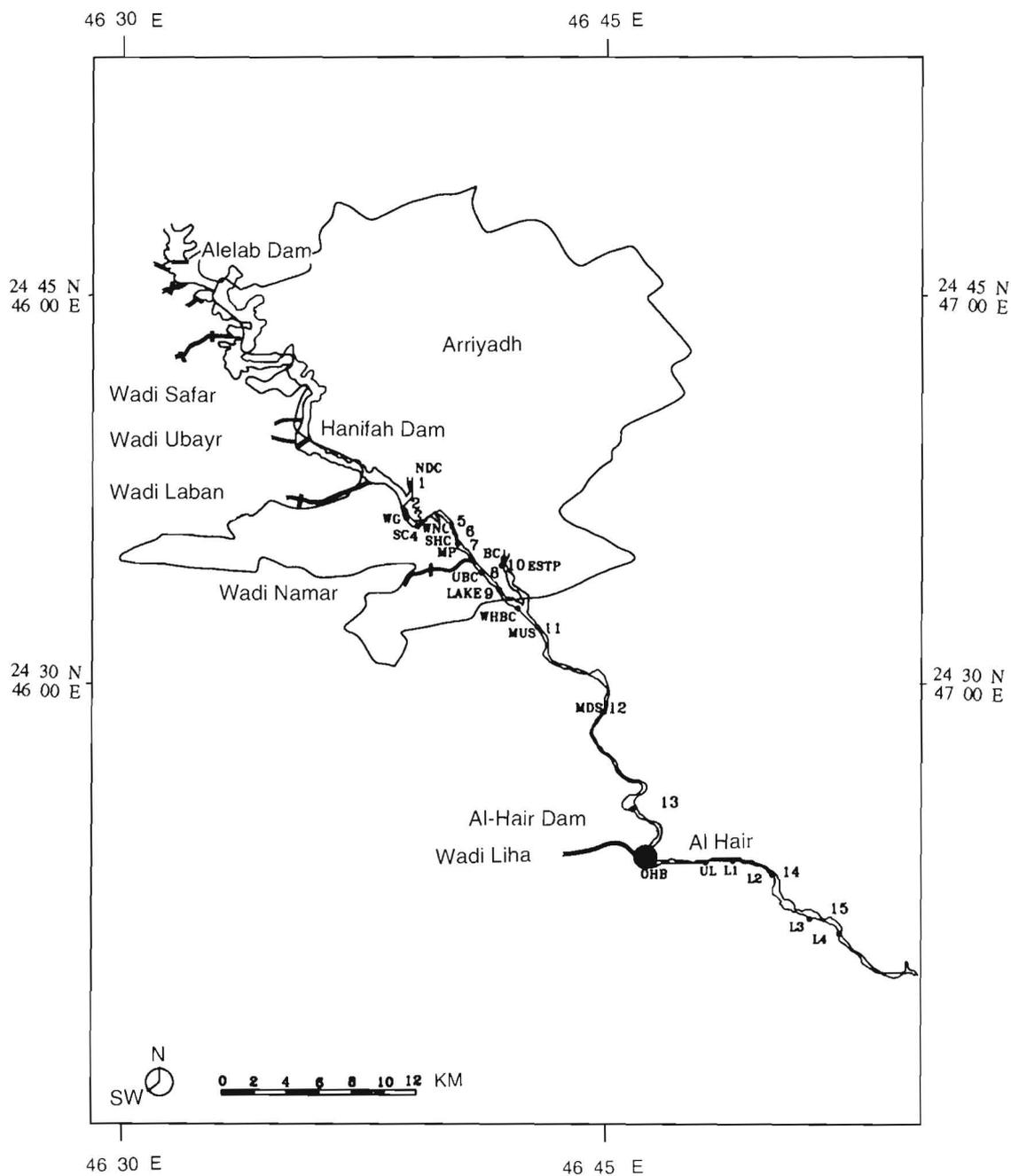


Figure 1. Map of Wadi Hanifah channel showing 1-15 sampling stations. (See text for explanation of abbreviations)

again in 1994. Sediment, water, plant and animal samples were collected between 0800-1200 h. Surface water temperature, pH and dissolved oxygen were determined at the site of sample collection. For other water quality parameters, samples were transported to the laboratory in an ice-box and analyzed immediately using a HACH DR/3000 Unit. Fauna associated with the sediment and detritus were collected with the help of an Ekman dredge. Some samples of submerged plants were collected by hand. The samples were washed and screened through sieves of different mesh sizes to separate molluscs and insects. Zooplankton were collected with the help of a zooplankton net. Zooplankton and invertebrates from diluted bottom samples were observed under a microscope. Fish samples were collected with the help of seine, cast and hand nets. The relative abundance of zooplankton, invertebrates, fish, frogs, birds, gastropods and insect at different stations was recorded as follows:

- absent, + very rare (1-5 individuals), ++ rare (5-20 individuals), +++ common (20-50 individuals), ++++ abundant (50-100 individuals), +++++ very abundant (more than 100 individuals). For fishes, frogs, birds and snails the relative abundance was based on the number of individuals present at each station, whereas for other invertebrates the abundance was determined from the samples collected either from 1 m² area (benthic invertebrates) or from 1 L of water sample (zooplankton). In February and October 1994 these sites were visited to observe the occurrence and abundance of molluscs, fishes, frogs and birds.

- Station 1.** Outlet of north diversion channel (NDC) forming the beginning of Wadi Hanifah stream. The rate of water flow was high and the stream is about 4 m wide and about 1.5 m deep. Reed plant (*Phragmites australis*) was the dominant emergent plant on one side of the stream and patches of *Typha domingensis* on the other side. *Chara* sp. and *Juncus* sp. were present in the main stream.
- Station 2.** Wadi Ghudwanah channel (WG) - 2.6 km from station 1. It opens into the main stream. The rate of water flow was low. It was about 2 m wide and about 0.5 m deep. Small reed plants were present on both sides and extending into the channel, as well. Detritus of mainly filamentous algae was abundant.
- Station 3.** 50 m below the confluence of Wadi Ghudwanah channel and Wadi Hanifah stream. Water flow rate was high. The stream is about 4m wide and about 1.5 m deep. *Chara* sp. and *Juncus* sp. were abundant in the stream. Reed plants were rare (Plate I).



Plate I. Overview of the main channel at station 3.

- Station 4.** Outlet of Sultana channel (SC) into the Wadi Hanifah stream, 1.3 km from station 2, concrete bottomed channel through which city effluent flows. Flow rate was low and the outlet of channel widened to about 3-4 m with a depth of about 0.30-0.50 m. Few filamentous algae were present.
- Station 5.** 2.5 km from Sultana channel. Main Wadi Hanifah stream is about 4.5 m wide and 1 m deep. Rate of water flow was high. Reed plant occurred only on one side. *Chara* sp. and *Juncus* sp. were present.
- Station 6.** 0.3 km from station 5. Outlet of Westship channel (WNC); all concrete with moderate rate of city effluent. The channel was about 8 m wide with about 0.50 m deep water. Near the confluence of Westship channel and Wadi Hanifah channel patches of reed plant and *T. domingensis* were present. Filamentous algae were abundant (Plate II).
- Station 7.** Manfuha Park (MP), 1 km from station 6. Main stream is about 5 m wide and 2 m deep with a high rate of water flow. Reed plants



Plate II. Overview of the westship channel discharging city effluent into the main channel.

on both sides were abundant, and *Chara* sp. was abundant in the main stream. On one side of the stream a marsh has developed with luxuriant growth of reed plant. In ponded areas *Chara* sp. and *Juncus* sp. were abundant.

Station 8. 1.3 km from station 7 (UBC). Considerable water spread beneath the bridge, water depth ranging from few centimeters to about 1.5 m. Reed plant and *T. domingensis* plants were abundant. In the main stream the rate of water flow was high, and *Chara* sp. and *Juncus* sp. were abundant.

Station 9. 5 km from station 8. Main stream forms a deep lake around which luxuriant growth of reed plant and *T. domingensis* plant has taken place. The stream emerges from the southeastern end of the lake and meets with the mixed flow from sewage plant and Batha Channel (Plate III).



Plate III. Overview of a part of the large lake (station 9).

- Station 10.** 1.5 km from Sewage Treatment Plant after the mixing of effluents of sewage treatment plant and Batha Channel. The water was dark-brown, and the bottom was black with bad smell. Flow rate was high. Main channel was about 5 m wide and about 1 m deep. Custard oil plant was abundant on sides of the channel (Plate IV).
- Station 11.** 5.5 km from the lake and upstream of Al-Mansooriah (MUS). Mixed effluent with bad odour, flow rate high; sludge abundant; reed plant *T. domingensis* and filamentous algae abundant. Considerable water spread (Plate V).
- Station 12.** 9.5 km from station 11 downstream of Al-Mansooriah (MDS); rate of water flow high; reed plant on the banks of the stream. *T. domingensis* was also present. Filamentous algae were rare. The channel was about 4 m wide and about 1 m deep.



Plate IV. Overview of the main channel at station 10 receiving effluents from the sewage treatment plant.

- Station 13.** 8.5 km from station 12, Al-Hair Dam. On both sides of the dam pools are formed. Luxuriant growth of reed plants was observed. The stream flows through the reed beds (Plate VI).
- Station 14.** 13.5 km from station 13. A shallow lake (L2) has been formed with considerable water spread; bottom with gravel. Water flow rate was moderate. Reed plants have become established on the margin of the lake. *T. domingensis* was also present. Filamentous algae were rare (Plate VII).
- Station 15.** 4.5 km from station 14 (L3). A number of lakes have been formed in this area. The depth of lakes ranged from 0.5 to 2.0 m. Reed plant was abundant. *T. domingensis* and filamentous algae were rare.



Plate V. Overview of a ponded area at station 11 showing effects of sewage pollution.



Plate VI. Overview of Al-Hair dam.



Plate VII. Overview of the main channel at station 14 where lake like environments have been formed.

Results and Discussion

The stream water is alkaline (pH range: 7.2 to 8.4) (Table 1), and total alkalinity as CaCO_3 ranged from 108 to 196 mg/L. The water is well oxygenated (3.5 to 6.8 mg/L) except at three stations (10, 11 and 13) where dissolved oxygen content was 3 mg/L and below. Stream water is very hard (total hardness range: 560 to 1400 mg/L) with large amounts of total dissolved solids, chloride, sodium, calcium and magnesium (Table 1). Ammonia, nitrite, BOD and COD levels varied considerably and were high at sampling stations 10, 11, 12 and 13, showing the influence of sewage effluent which was entering into the channel upstream to station 10 (Fig. 1). This stretch of the channel was polluted with sewage effluent, and the level of pollution gradually decreased from sampling station 10 to 13.

The stream water at stations 14 and 15 was well oxygenated with low levels of ammonia, nitrite and BOD. Nitrate levels were comparable to that of a normal stream environment, but phosphate levels were high in the stream receiving sewage effluent.

Table 1. Temperature and some water quality parameters (mg/L) recorded at different sites of Wadi Hanifah Stream

Parameters	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Temp. °C	25.3	18.8	23.6	26.8	21.8	26.6	22.2	23.2	21.9	26.5	23.5	21.9	20.4	18.4	19.2
pH	7.6	7.9	7.8	8.4	7.3	7.5	7.6	7.7	7.6	7.6	7.4	7.6	7.4	7.3	7.2
DO	5.0	6.0	4.8	5.3	3.5	3.9	6.4	4.6	5.7	3.1	2.8	3.8	2.2	5.4	5.6
Alkalinity as CaCO ₃	148	196	164	160	160	160	164	160	176	108	128	156	148	140	136
Bicarbonates	181	239	200	175	185	185	200	185	215	132	156	190	181	171	166
Hardness	1060	1400	1260	560	1220	700	1060	1000	1040	560	740	740	780	780	780
EC mmhos/cm	2.64	4.14	3.38	1.52	3.39	1.79	2.99	2.75	2.98	1.64	2.12	2.22	2.30	2.30	2.30
TDS	1690	2650	2163	973	2170	1146	1914	1760	1907	1050	1357	1420	1472	1472	1472
NH ₃ -N	0.11	0.09	0.20	0.64	0.90	0.08	0.59	0.30	0.20	13.00	10.90	7.80	4.20	0.70	0.35
NO ₂ -N	0.22	0.07	0.05	0.06	0.04	0.02	0.03	0.04	0.02	0.34	1.93	0.86	1.05	0.20	0.07
NO ₃ -N	16.5	4.0	18.5	3.5	21.0	1.5	17.0	15.0	16.0	6.0	9.0	5.0	7.5	6.0	6.0
PO ₄	0.7	0.6	0.5	0.5	0.4	0.1	0.25	0.4	5.0	12.1	10.7	10.0	9.5	9.3	8.2
Chloride	373	533	408	1775	426	160	338	337	355	195	249	266	266	266	266
Sodium	260	533	360	155	378	180	325	295	312	160	243	243	278	253	275
Potassium	11	6.7	11	17	11	14	12	11	12	15	14	15	15	15	15
Calcium	305	369	329	160	345	160	305	256	281	160	185	185	185	200	200
Magnesium	72.4	116	106	39	87	73	72.4	87	82	39	68	68	68	68	68
BOD	3.6	1.2	4.8	6.0	6.0	7.2	6.0	4.8	6.0	24.0	19.2	10.8	9.6	7.2	6.0
COD	19	6	27	29	31	33	34	25	29	128	108	74	67	48	32

All along the course of Wadi Hanifah stream reed plant (*P. australis*) has established on the banks of the stream, and in some flat areas the reed plant has covered a considerable part of it. *T. domingensis* is also common (Plate I-VII).

Ichthyofauna comprised of 7 introduced fish species, namely, *Oreochromis niloticus*, *O. aureus*, *Oreochromis* sp., *Poecilia reticulata*, *P. latipinna*, *Xiphophorus maculatus* and *Pteroplichthys multiradiatus* (Table 2). Mouth-brooding and herbivorous tilapias (*Oreochromis*) are cultured in two fish farms located in the Wadi Hanifah catchment area. It appears that fishes accidentally escaped from the farms and have established large populations of tilapia in the Wadi Hanifah stream. A deliberate introduction of tilapia in the stream could not be established. The other four species are aquarium fishes and are sold in pet shops. These species appear to be released by aquarists into the Wadi Hanifah stream, where they have established successfully.

The relative abundance of seven introduced fish species is given in (Table 2). Tilapias are the most abundant species. They have established very well in the whole stretch of the stream except at Station 10 where it was not recorded in December 1993. At this point the stream was severely polluted with sewage and slaughter-house effluents effecting low dissolved oxygen and high ammonia and nitrite levels. BOD and COD levels were also high (Table 1). However, in October 1994 tilapias were present at station 10, 1 km away from the sewage outfall in the main channel. Tilapias were found in almost all habitats with silt, sand and gravel bottom, but were more abundant in shallow areas in the margin of the main channel or in ponded and lake like environments. Even in fast flowing segments of the channel tilapias were recorded, but mostly in the marginal waters, and when disturbed they moved into the submerged vegetation formed by *Chara* sp. and *Juncus* sp. As a large population of tilapia has established in the stream a considerable quantity of tilapia is caught by people for personal consumption using cast nets.

P. reticulata is another common species in the stream and was recorded from all stations except station 10 (Table 2). It was more abundant in shallow flooded waters and in marginal waters of the main channel where vegetation coverage was present. It will take shelter among the vegetation when disturbed. It was found in large schools in the marginal waters of the lake and in shallow ponded waters. *P. latipinna* was recorded only from stations 5,6,7 and 8 where the bottom was of silt and sand (Table 2) and there was also considerable vegetation cover in the marginal waters. The population size is small in the main channel where few (5-15) specimens were seen at any time.

Table 2. Occurrence and relative abundance of fishes and frogs

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Osteichthyes															
Perciformes															
Cichlidae															
<i>Oreochromis niloticus</i>	-	+++	+++	++	++++	+++++	+++++	+++	++	-	++	++	++++	+++++	+++++
<i>O. aureus</i>	-	-	++	++	+	+	+++	+	-	+*	-	-	++	++	++
<i>Oreochromis</i> sp.	+	+++	+++	++	++++	+++++	+++++	+++	++	++*	++	++	++++	+++++	+++++
Cyprinodontiformes															
Poeciliidae															
<i>Poecilia reticulata</i>	++++	+++	+++	+	+++	+++	+++	+++++	+++++	-	++	+	+++	+++++	+++++
<i>Poecilia latipinna</i>	-	-	-	-	++	++	++	++	-	-	-	-	-	-	-
<i>Xiphophorus maculatus</i>	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-
Loricariidae															
<i>Pteryoplichthys multiradiatus</i>	-	-	-	-	-	-	+++	++	-	-	-	-	-	-	-
Amphibia															
<i>Rana ridbunda</i>	+	+	+	-	++	+	+++	++	++	-	++	++	++	++	++

- absent, + v. rare, ++ rare, +++ common, ++++ abundant, +++++ very abundant. *recorded in October 1994 only.

X. maculatus was also recorded only at stations 5,6,7 and 8, and was always found in small numbers, usually 2 to 5, at any place (Table 2). The habitat preference of *P. latipinna* and *X. maculatus* were the same, but they did not occur together.

P. multiradiatus, an armored catfish, was recorded only at station 7 and 8 (Table 2), from the fast flowing channel with sandy and gravel bottom and reed plants in the marginal waters and from the pond formed near the channel. The pond's bottom was sandy with considerable growth of submerged plants (*Chara* sp. and *Juncus* sp.) in the open pond and reed plants all around the pond. A breeding population of *P. multiradiatus* has become established. Four living specimens were caught from the main channel and 40-50 slightly spoiled specimens (size range 12-26 cm) were found entangled in a gill-net which was taken out earlier and left among the reed plants. In October 1994 the channel water was clear and a number of specimens were seen at the bottom. This is the first record of *P. multiradiatus* from Saudi Arabia.

None of the fish species reported have been recorded before from the Arriyadh region of Saudi Arabia (Alkahem and Behnke 1983, Krupp, 1983). However, Ross (1983) has reported wild populations of tilapias (*O. niloticus*, *O. aureus*, *O. mossambicus*), *P. reticulata*, *P. latipinna* and *X. maculatus* from the oases of the Eastern Province of Saudi Arabia.

A very good population of marsh frog, *Rana ridbunda*, has developed in the stream (Table 2), particularly in those areas where the water has spread outside the stream and luxuriant growth of plant has taken place.

Three species of snails were recorded in the Wadi Hanifah stream (Table 3). The snails were mainly found on the hard surface of stream and lake banks and among the detritus. They were also found attached to submerged plants. The snails were identified after Brown and Wright (1980).

Melanooides reticulata was the most abundant snail present all along the course of the stream with the exception of station 10 where it was absent. *Lymnaea auricularia* was next in abundance and was recorded only from 11 stations. *Paludestrina glaucovirens*, a large sized snail, (40 x 25 mm) was found in few numbers at station 9 (Lake) and is reported for the first time from Saudi Arabia.

Other invertebrate fauna is generally poor (Tables 3 and 4). Insects were few and recorded mainly from the lakes (Table 3). Similarly, crustacea (Ostracoda and Copepoda) (Table 4) were poorly represented. Rotifers were recorded from 10

Table 3. Occurrence and relative abundance of gastropods and insects

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Gastropoda															
Thiaridae															
<i>Melanoides reticulata</i>	++++	++	++++	++	++	++++	++++	+++	+++	-	++	+++	+++	+++	+++
Lymnaeidae															
<i>Lymnaea auricularia</i>	++	+++	++	+	-	-	+	+	-	-	++	+++	++	++	++
<i>Paludetrina glaucovirens</i>	-	-	-	-	-	-	-	-	+++	-	-	-	-	-	-
Arthropoda															
Insecta															
Odonata	-	-	+	-	-	-	+	-	-	-	-	-	+	+	+
Diptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coleoptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemiptera	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-

- absent, + v. rare, ++ rare, +++ common, ++++ abundant, +++++ very abundant.

Table 4. Occurrence and relative abundance of some invertebrates

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rotifera															
Monogononta															
Ploima															
Brachionidae															
<i>Brachionous</i> sp.	+	+	+	-	-	+	+	-	+	-	++++	+	-	+	+
<i>Keratella</i> sp.	+	+	+	-	-	+	+	-	+	-	++++	+	-	+	+
Ostracoda	-	+	+	-	+	-	-	-	+	-	-	-	+	+	+
Copepoda	+	+	-	+	-	-	+	-	-	-	+	+	-	-	+
Protozoa	+	+	+	-	-	-	+	-	-	-	-	-	-	-	+
Nematoda (roundworm)	-	-	-	-	-	-	+	-	-	-	+	++	-	++++	+
Annelid worm	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+

- absent, + v. rare, ++ rare, +++ common, ++++ abundant, +++++ very abundant.

stations. It appears that invertebrate fauna with the exception of gastropods is not very well developed in the stream.

Wadi Hanifah stream, a riverine biotope, together with its Al-Mansooriyah and Al-Hair Dam lagoons, lakes and ponded areas have turned into interesting habitats for birds, and from October to March a large number of migratory bird species is seen. Dense reed beds, patches of *T. domingensis*, and clusters of tamarisk provide cover for a number of resident and migratory birds. In lagoons the water is shallow, sometimes with extensive mud flats, and provides ideal habitat for waders. Deeper lakes provide habitat for teals and ducks (Table 5).

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Table 5. Occurrence and relative abundance of birds in Wadi Hanifah Stream

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12*	13	14	15
Rallidae															
Little crane (<i>Porzana parva</i>)	+	-	++	-	-	-	+	-	+	++	+	++	++	-	++
Coot (<i>Fulica atra</i>)	-	-	-	-	-	-	+	-	-	-	-	-	+++	-	-
Recurvirostridae															
Black-winged stilt (<i>Himantopus</i> <i>himantopus</i>)	-	-	-	-	-	-	-	-	+	++	-	+++	+	+	+
Charadriidae															
Little ringed plover (<i>Charadrius dubius</i>)	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-
Ringed plover (<i>C. hiaticula</i>)	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+
Scolopacidae															
Little stint (<i>Calidris minuta</i>)	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+
Curlew sandpiper (<i>C. ferruginea</i>)	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Temmincks stint <i>C. temminckii</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+

Table 5. (Contd.)

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12*	13	14	15
Red tshank <i>Tringa totanus</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
Marsh sandpiper <i>T. stagnatilis</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
Ardeidae Grey heron <i>(Ardeola cinerea)</i>	-	-	-	-	-	-	+	-	+	++	+	++	++	+	+
Little bittern <i>(Ixobrychus minutus)</i>	-	-	-	-	-	-	+	-	+	-	-	+	+	+	+
Squaco heron <i>(Ardea ralloides)</i>	-	-	-	-	-	-	+	-	-	-	-	-	+	+	+
Little egret <i>(Egretta garzetta)</i>	-	-	-	-	-	-	-	-	-	+	-	+	+	+	+
Ciconiidae Glossy ibis <i>(Plegadis falcinellus)</i>	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-

Table 5. (Contd.)

Species	Sampling Stations														
	1	2	3	4	5	6	7	8	9	10	11	12*	13	14	15
Anatidae															
Teal (<i>Anas crecca</i>)	-	-	-	-	-	-	-	-	-	-	-	+++	++	+	+
Shoveller (<i>A. clypeata</i>)	-	-	-	-	-	-	-	-	-	+	-	+	-	+	+
Shelduck (<i>Tadorna tadorna</i>)	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+
Mallard (<i>Anas platyrhynchos</i>)	-	-	-	-	-	-	-	-	-	+	-	+	-	+	+
Laridae															
Gulls (<i>Larus</i> sp.)	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Podicipediidae															
Black-necked grebe <i>Podiceps nigricollis</i>	-	-	-	-	-	-	-	-	+	-	-	+	+	+	+
Phalacrocoralidae															
Cormorant <i>Phalacrocorax carbo</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+

- absent, + v. rare, ++ rare, +++ common, ++++ abundant, +++++ very abundant. *includes Mansouria Lagoon

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دراسة بيئية أولية للمجموعة الحيوانية في مجرى وادي حنيفة

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لقد أجري مسح شامل لمجرى وادي حنيفة الواقع في منطقة الرياض - المملكة العربية السعودية ، ما بين ١٩٩٣-١٩٩٤ م ، تمت الزيارة الأولى خلال الفترة من ٤-١٢ ديسمبر ١٩٩٣ م ، وثلاث زيارات أخرى خلال شهر فبراير ، وأكتوبر ١٩٩٤ م ، وذلك لغرض دراسة ومعرفة المجموعة الحيوانية لمجرى وادي حنيفة . شملت هذه الدراسة على عينات مياه ، رسوبيات ، نباتات ، أسماك ، ضفادع وحلزونات ، جمعت من ١٥ محطة على امتداد المجرى المائي لوادي حنيفة .

أظهرت الدراسة البيئية الأولية لمجرى وادي حنيفة عن وجود مجرى مائي يجري من الشمال (البديعة) إلى الجنوب (جنوب شرق مدينة الحائر) بمسافة طولها حوالي ٥٠ كيلومتر .

المصدر الرئيسي لمجرى وادي حنيفة هو مياه الصرف الصحي ، ومياه الزراعة وضخ المياه السطحية لمدينة الرياض . ظهر بوضوح تأثير مياه الصرف الصحي على عينات المياه في المحطة رقم ١٠ و ١٣ ثم بعد ذلك تحسنت نوعية المياه .

حافة المجرى المائي لوادي حنيفة نما عليها القصب الأحمر والبردي . سجلت ٧ أنواع من الأسماك التي بدأت تتكاثر طبيعياً في مجرى وادي حنيفة ، ثلاث منها من أنواع أسماك البلطي ، والأربع أنواع الأخرى من أسماك الزينة . كما سجل ثلاث

أنواع من الحلزون ، ونوع واحد من الضفادع . وكذلك قد بينت هذه الدراسة قلة وجود الأنواع الأخرى من اللافقاريات والتي شملت الحشرات ، القشريات ، الدولبيات ، الديدان الحلقية ، الديدان الخيطية المتحررة ، والأوليات في مجرى وادي حنيفة . كما سجل ٢٢ نوع من الطيور المهاجرة في مجرى وادي حنيفة .