

The freshwater fish fauna of Jordan

N. HAMIDAN

Abstract: A review of the native freshwater fishes of Jordan is presented. A total of 15 species of fresh water fish belonging to six families (Cyprinidae, Balitoridae, Clariidae, Cyprinodontidae, Cichlidae and Blenniidae), represented in 12 genera have been recorded in Jordan. Notes on their ecology are given based on recent field observations.

Key words: Freshwater, fish, Jordan, Cyprinidae, Balitoridae, Clariidae, Cyprinodontidae, Cichlidae, Blenniidae.

Introduction

The freshwater fish fauna of Jordan is very characteristic since it was formed from five different faunal origins; the Palaearctic, Indoasiatic, Afrotropical, Tethys relict and Mediterranean. This uniqueness attracted ichthyologists and biologists already in the 18th and 19th century. HASSELQUIST (1757) reported one cichlid from Lake Tiberias. At the same time the Austrian ichthyologist HECKEL (1843) described numerous species from Syria where five of them occurred in the Jordan River. TRISTRAM (1884) published a detailed account of the fishes of Palestine. PELLEGRIN (1911, 1933) described two new species of the genus *Phoxinellus* and TREWAVAS (1942) reviewed the cichlids of Palestine. NELSON (1973) gave a list of the fishes inhabiting the springs and water courses in Azraq Desert Oasis, in which most of them were introduced. AL-ABSY & MIR (1986a, b) gave new localities and new records for Jordan. A new cyprinodontid, *Aphanius sirhani*, was described by VILLWOCK et al. (1983) from Azraq pools. KRUPP & SCHNEIDER (1989) reviewed the fresh water fish of Jordan River drainage basin and Azraq Oasis where they identified 25 fresh water fish species native to Jordan River drainage basin and 27 introduced. Three years later, MIR (1990) carried out a taxonomical and distributional study on the fresh water fish of Jordan. She recorded 15 native and 6 introduced species. In 2000 the

Royal Society for the Conservation of Nature (RSCN) in co-operation with Limnology department in the University of Vienna performed fish survey in Azraq to study the status of *Aphanius sirhani*. Recently, HAMIDAN & MIR (2003) studied the status of *Garra ghorensis* in the lower Jordan Valley.

In this account, the freshwater fish fauna is reviewed based on latest available studies, collected data, and filed observations.

Systematics of the freshwater fish of Jordan

A total of 15 species of fresh water fish belonging to six families and represented in 12 genera have been recorded in Jordan. All of these species are primarily fresh water fish except the cyprinodontid and cichlid fishes that are considered as secondary fresh water fish.

Family Cyprinidae

This family is represented by five genera and seven species. Family Cyprinidae is the largest among the fresh water fish, distributed throughout Eurasia, Africa, and North America (NELSON 1994). Species of this family are characterised by the presence of 1-3 rows of teeth, each row with a maximum of 8 teeth. Lips are thin, plicae or papillae are absent; mouth sometimes sucker-like (e.g. *Garra* and *Labeo*). Barbels are present



Fig. 1: *Acanthobrama lissneri* is an endemic species to the Jordan River basin.

or absent. Praemaxilla usually borders the upper jaw making the maxilla entirely or almost entirely excluded from the gape. Upper jaw is usually protrusible. Dorsal fin with spine-like rays in some species. Maximum length at least 2,5 m to probably 3 m in *Catlocarpio siamensis*; many species are less than 5 cm (NELSON 1994).

Acanthobrama HECKEL 1843

Small sized cyprinids, ventral keel between pelvic fins and anus with two rows of scales meeting ventrally or separated by a narrow strip of naked skin. Last unbranched dorsal ray smooth, thickened and ossified proximally. This genus is endemic to the Middle East, and contains six species (KRUPP & SCHNEIDER 1989).

Acanthobrama lissneri TORTONESE 1952 (Fig. 1)

Diagnosis: shiny silver coloured in the fresh specimens, medium sized cyprinid. Mouth subterminal, cleft reaching below nostrils, pharyngeal teeth smooth or slightly serrated, pointed and hooked at their tips.

Distribution: This species is endemic to the Jordan River drainage basin, and was collected from Yarmouk River. It was introduced in Azraq Oasis (KRUPP & SCHNEIDER 1989, MIR 1990).

Remarks: The species in Azraq Oasis shows nocturnal activities, and manage to cope with the introduced cichlids. It feeds

on wide range of food items mainly crustaceans and filamentous green algae. Its population increased since year 2000 and was found to breed in late February to the end April; Medium sized female (6 cm) can lay more the 3600 eggs (personal observation).

Barbus CUVIER 1817

Small, medium-sized cyprinids with a short dorsal fin. Lateral line usually complete, mouth inferior, 2-4 barbels or no barbels at all (KRUPP & SCHNEIDER 1989).

Barbus canis VALENCIENNES in CUVIER & VALENCIENNES 1842

Diagnosis: Medium-sized fish with convex dorsal profile of the juvenile's body and concave in adult specimens. Teeth are pointed, mouth with two pairs of barbels, and caudal forked. Live specimens are silvery-olive on flanks and dorsally, and silvery-whitish on ventral surface. Fins opaque with greyish or yellowish tinge (KRUPP & SCHNEIDER 1989).

Distribution: This is a common species in the Jordan River and its tributaries, King Talal Dam and near Jarash (MIR 1990). It was introduced into Azraq Oasis (KRUPP & SCHNEIDER 1989), but not recorded in Azraq since 2000. This species has a commercial value. It was found to inhabit polluted water in King Talal Dam (MIR 1990).

Remark: The systematics of this species is not well defined. Several authors stated that this species is not closely related to the typical *Barbus* (KRUPP & SCHNEIDER 1989). Further studies on this species are required to clarify its systematic status.

Barbus longiceps VALENCIENNES in CUVIER & VALENCIENNES 1842

Diagnosis: Body elongate, slightly compressed in juveniles and cylindrical in adults. Head long and pointed (KRUPP & SCHNEIDER 1989).

Distribution: Common and wide spread in the Jordan and Yarmouk rivers and King Talal Dam (MIR 1990). This species is endemic to the Jordan River drainage basin (KRUPP & SCHNEIDER 1989).

Remarks: This species is a bottom dweller and feed mainly on benthic organ-

isms. It spawns in winter in shallow water (KRUPP & SCHNEIDER 1989).

Capoeta VALENCIENNES in CUVIER & VALENCIENNES 1842

Medium sized to large cyprinid with elongated cylindrical body, dorsal fin short and possess one pair of barbells.

Capoeta damascina (VALENCIENNES IN CUVIER & VALENCIENNES 1842) (Fig. 2, 3)

Diagnosis: The species is extremely variable in body shape and colour pattern. Body elongated, slightly compressed in juvenile, cylindrical in adults. Mouth is ventrally located, crescentic with smooth upper lip, lower lip thick with a hard sharp anterior horny edge. One pair of barbels, caudal forked (KRUPP & SCHNEIDER 1989).

Distribution: This is the most common and ubiquitous species within the Jordan River drainage basin (KRUPP & SCHNEIDER 1989, MIR 1990) where it is found in all habitats from fast running streams to stagnant lakes. It was also found to occur in most of the river and springs of the Dead Sea basin, mainly in Mujib, Hydan, Hassa, Fifa, and Khnaizeerah (HAMIDAN & MIR 2003). Populations in the Dead Sea basin are the most southern range of its distribution.

Remarks: Owing the great variation in body shape, meristic characters, and colour pattern, population variations could exist that may lead to formation thought its range of distribution between southern and northern populations (KRUPP & SCHNEIDER 1989). Hybrids of *B. canis* and *C. damascina* were found along Zarka River (MIR et al. 1988).

Garra HAMILTON 1822

Small to medium sized cyprinids, body cylindrical. Head region and caudal peduncle are compressed. Mouth inferior, lower jaw covered with a horny sheath, lower lip forming a mental disc covered by papillae, two pairs of papillae (KRUPP & SCHNEIDER 1989).

Garra ghorensis KRUPP 1982 (Fig. 4)

Diagnosis: Medium sized cyprinid. Pelvic fin origin posterior to dorsal fin origin, dorsal fin with four unbranched and



Fig. 2: *Capoeta damascina* showing breeding tubercles from Hydan River.

seven branched rays. Caudal fin slightly forked (KRUPP 1982).

Distribution: This species was recorded in the Dead Sea area starting from Ain al-Haditha to Wadi khnaizeerah, while it also occurred in the upper part of some streams like Burbaita and Afra hot springs (HAMIDAN & MIR 2003).

Remarks: This is an endemic species to the Dead Sea region. It was originally described as a subspecies of *G. tibanica*, however, later studies revealed that *G. ghorensis* is separate from *G. tibanica* (KRUPP 1982). The species is believed to have an African

Fig. 3: *Capoeta damascina* from Mujib River.





Fig. 4: *Garra ghorensis* from Ain Al Haditha.

origin. HAMIDAN & MIR (2003) found this species to survive in streams with temperature ranged from 23,5°C in Wadi al-Hassa and Khneizera dam to 41°C in Afra hot spring and Wadi al-Burbaita. The population structure of *G. ghorensis* in most localities showed a disturbed population where few Young of Year (YOY) fish have success to survive. This fish inhabits shallow, fast and clear waters with stony beds. It remains attached to the stony bottom with the help of an adhesive pad which lies on the ventral side of the head. (HAMIDAN & MIR 2003).

Fig. 5: *Garra rufa* from Zarka River.



Garra rufa (HECKEL 1843) (Fig.5)

Diagnosis: Medium sized cyprinid, dorsal fin origin well in front of pelvic fin origin. Four unbranched and 7, 8, or 9 branched dorsal rays. Dorsal fin is deeply forked, and body often marked is mottled with dark grey, greenish-blue spot behind gill opening.

Distribution: Occurs along the Jordan River and its tributaries, and extends to the Dead Sea basin reaching Mujib River, where it disappears and replaced by *G. ghorensis* in Ain al-Haditha further south (HAMIDAN & MIR 2003).

Remarks: There is a taxonomical confusion about the Jordan River's *G. rufa* population. Some author recognised two subspecies; *G. r. rufa* in the Jordan River and *G. rufa barbel* as the Mesopotamia's population (MENON 1964). This view has been rejected since several populations of *G. rufa* were identical along its range of distribution (KRUPP & SCHNEIDER 1989). This species prefers fast running water with rocky substrate, it was observed in Mujib River swimming against the current in highly turbulent water.

Hemigrammocapoeta PELLEGRIN 1927

Dwarf cyprinid, body moderately compressed, mouth inferior, transverse, only slightly protractible, lower jaw usually with a horny sheath, upper lip covered with rostral flap and two pairs of barbels (KRUPP & SCHNEIDER 1989).

Hemigrammocapoeta nana (HECKEL 1843)

Diagnosis: Mouth small and inferior, body compressed, snout rounded.

Distribution: This species was recorded from the Jordan River (KRUPP & SCHNEIDER 1989), Baqura near the Yarmouk River (MIR 1990).

Remark: Young specimen are characterised by dark black band on the lateral side of the body. KRUPP & SCHNEIDER (1989) were not able to substantiate the presence of *Tylognathus steinitziorum*, described by KOSSWIG (1950) as a separate species from *H. nana*.

Family Balitoridae

Mouth inferior, with at least 3 pairs of barbells. Pelvic fins separate or fused under belly. Gill opening may or may not be restricted (NELSON 1994).

Nemacheilus BLEEKER 1863

Elongated body, subcylindrical, caudally compressed, head slightly depressed, and dorsal fin originates in front of vertical of pelvic fin origin. Minute scales, becoming larger caudally or completely absent. Two pairs of rostral and one pair of maxillo-mandibular barbels (KRUPP & SCHNEIDER 1989). Species of this genus had bony capsules of the swim bladder that is different among species and lead to the correct identification.

Nemacheilus insignis (HECKEL 1843) (Fig. 6)

Diagnosis: Body elongated, upper margin of dorsal fin more or less straight. Three pairs of barbels, lips furrowed a broad median interruption at the lower lip. Caudal forked, and body covered with scales that are large and viable in shape.

Distribution: This species is known to occur in the Jordan and Yarmouk rivers and in the Dead Sea basin (KRUPP & SCHNEIDER 1989). Additionally, it was found along some streams within the Mediterranean zone that drains to the Jordan Valley, Wadi Sir, Al Qunaiya and Wadi Kufranja (MIR 1990) Further south, it was collected from Mujib River, where as this population represents the most southern range of its distribution (field observation).

Remarks: This species is highly variable in its body shape and colour patterns even in adjacent populations. Perhaps different subspecies exist along the Damascus and Jordan River drainage populations (KRUPP & SCHNEIDER 1989).

Family Clariidae

Dorsal fin extending over much of body length. Dorsal fin rays usually over 30 without a leading spine. Dorsal fin discontinuous or united to caudal fin. Wide gill openings. Barbels 4 pairs. Airbreathing is accomplished with a labyrinthic organ arising from



Fig. 6: *Nemacheilus insignis* from Mujib River.

the gill arches ("labyrinth catfishes"). Some species are capable of travelling over short distances on land ('walking catfishes'). Some are burrowers with small eyes and the pectoral and pelvic fins small or lacking (NELSON 1994).

Clarias SCOPOLI 1777

Body elongate, head depressed, posterior part of the body compressed. Very long dorsal and anal fins reaching or almost reaching caudal fin origin. One pair of nasal, one pair of maxillar and two pairs of mandibular barbels. Respiratory organ present and swim bladder very small (KRUPP & SCHNEIDER 1989).

Clarias gariiepinus (BURCHELL 1822)

Diagnosis: Dorsal and anal fins almost reaching caudal fin origin, no adipose dorsal fin. Four pairs of long barbels.

Distribution: The species is known to occur in the Jordan River (KRUPP & SCHNEIDER 1989, MIR 1990). It was introduced to Azraq Oasis (KRUPP & SCHNEIDER 1989).

Remarks: Last record of this species from Azraq Oasis was in 2000 (WEISENBACHER & HORST 2000). No further records were obtained after. The species used to occur in Sauda pool that was totally dried in 2002. Small populations are known in privately owned fish farms in Azraq area.



Fig. 7: *Aphanius dispar richardsoni* showing male (above) and females (below) from Fifa.

Family Cyprinodontidae

Chiefly freshwater and brackish fish; rarely coastal marine. Egg-laying. Males without gonopodium (external fertilisation). Dorsal processes of maxillaries expanded medially, nearly meeting in the midline; lateral arm of maxilla expanded. About 22 cm maximum length (NELSON 1994).

Aphanius NARDO 1827

Total length rarely exceeds 100 mm, body stout or moderately elongate, slightly compressed. Dorsal fin origin slightly in front of vertical of anal fin origin. Mouth su-

perior, lower jaw projecting, teeth on jaws usually tricuspid. Pronounced sexual dimorphism in body size, length and shape of fins, and coloration, fresh and brackish water, rarely marine.

Aphanius dispar richardsoni (BOULENGER 1907) (Fig. 7)

Diagnosis: Body moderately stout, mouth superior, 12-20 tricuspid teeth in each jaw. Male with light brown stripes on body sides and female with dark vertical bands.

Distribution: The distribution of this subspecies is restricted to wadis and freshwater bodies along the Dead Sea basin (KRUPP & SCHNEIDER 1989, HAMIDAN & MIR 2003).

Remarks: Habitats of this species are under severe changes in the form of dam construction that pose threats. This species can tolerate high salinity that may reach 2000 ppm in stream near Ghor Fifa, southern end of the Dead Sea (Field observation). It was found to inhabit the most western reaches of streams that extend westwards to the Dead Sea basin, where salinity is high.

Aphanius sirhani VILLWOCK, SCHOLL & KRUPP 1983 (Fig. 8, 9)

Diagnosis: Dorsal fin origin slightly before vertical of anal fin origin. Males with basic colour is brown dorsally and white laterally and ventrally, with 8-11 sharply delimited greenish-brown, or greenish-black bars on flanks, pectoral region yellowish, and dorsal fin blackish with two lateral yellow stripes. Females basic colour brownish, lighter ventrally, numerous indistinct dark brown spots on flanks, and 8-12 black spots at level of lateral line (KRUPP & SCHNEIDER 1989).

Distribution: This species is confined to the Azraq Oasis, and is considered endemic to Jordan.

Remarks: The species is threatened of extinction due to extensive water extraction from Azraq oasis (KRUPP & SCHNEIDER 1989). Recent efforts to recover the population of this threatened species in Azraq Wetland Reserve begun since 2000.

Fig. 8: *Aphanius sirhani* male from Azraq pools.



Family Cichlidae

Widely distributed family, Body shape quite variable, mostly moderately deep and compressed. A nostril on each side of head. Body shape quite variable, mostly moderately deep and compressed. A nostril on each side of head. Interrupted lateral line in most species. Scales in lateral lines may be over 100, usually 20-50. Dorsal fin usually with 7-25 spines and 5-30 soft rays. Spines in anal fin 3-15 (generally 3); soft rays 4-15 (a few with 30) (KULLANDER 1998).

Oreochromis GÜNTHER 1889

Medium-sized to large cichlids, anal fin with (2) 3-4 (6) spines (three in most species), scales usually cycloid. Scales on belly smaller than flank scales (KRUPP & SCHNEIDER 1989).

Oreochromis aureus (STEINDACHNER 1864) (Fig. 10)

Diagnosis: Dorsal fin with (14)15-16 (17) spines, anal fin with 3 spines, hind margin of caudal fin truncate. Males grow more than female and have longer pelvic fin. General body colour is greyish-blue, darker dorsally and silvery-whitish ventrally.

Distribution: Jordan River basin, introduced to Azraq and to other springs along to the Dead Sea like Ain al-Haditha (KRUPP & SCHNEIDER 1989, HAMIDAN & MIR 2003).

Remarks: Because of its commercial value as a low price fish, the species is one of the most common species used in fish farms. It had a remarkable effect on the endemic species in Azraq since it uses wide breeding grounds, competing for food, and direct predation for both eggs and fry of *A. sirhani* (field observation). Farmers introduced initially *O. aureus* in Ain al-Haditha during 2000 for breeding purposes (HAMIDAN & MIR 2003).

Tilapia SMITH 1840

Medium size cichlids, anal fin with three spines, and scales usually cycloid. Substrate spawner and guarders of the brood, sexual dimorphism, dichromism minimal or missing (KRUPP & SCHNEIDER 1989).



Tilapia zillii (GERVAIS 1848) (Fig. 11)

Fig. 9: *Aphanis sirhani* female from Azraq pools.

Diagnosis: pharyngeal bone with broad dentigerous area and short posterior blade with tricuspid teeth, sparsely distributed. Silver grey with few bands on the body sides, most of young specimen with large black spot ringed with white (KRUPP & SCHNEIDER 1989).

Distribution: This species is widely distributed in Jordan valley (MIR 1990) and it has been introduced in Azraq wetland Oasis (KRUPP & SCHNEIDER 1989).

Remarks: This is an omnivorous species, and feeds on a wide range of food in

Fig. 10: *Oreochromis aureus* from Azraq pools.





Fig. 11: *Tilapia zillii* is a common species in the Jordan valley.

Azraq Oasis. It was found to compete with the endemic fish, *A. sirhani*, for breeding ground since it guards its egg and had territorial behaviour (being very aggressive) towards any other fish that comes close to its nest. Direct predation of other fishes was observed.

Sarotherodon RÜPPELL 1852

Medium size cichlids, three spines in anal fin, and scales usually cycloid. Eggs and young are brooded by both parents or by males, sexual dimorphism and dichromism minimal or absent (KRUPP & SCHNEIDER 1989).

Sarotherondon galilaeus (LINNAEUS 1785)

Diagnosis: Pharyngeal bone is heart shape with lateral broad lobes bearing large number of long slender teeth. Interorbital wide, 2 rows of cheek scales and caudal slightly emarginated (KRUPP & SCHNEIDER 1989).

Distribution: This fish is abundant in the upper reaches of the Jordan River (KRUPP & SCHNEIDER 1989). Previously collected from Azraq (MIR 1990).

Remarks: Both male and female participate in mouthbrooding and juveniles are released at about 12 mm (TREWAVAS 1983). Recent field studies in Azraq failed to capture this species.



Fig. 12: *Cyprinus carpio* is an introduced species. This specimen was collected from Azraq pools.

Family Blenniidae

Species of this family are chiefly tropical and subtropical marine; rare in fresh- and brackish water. Scaleless body (lateral line scales modified in few species). Praemaxillae not protractile. Usually blunt head. Pelvic fins present in all but 2 species, before pectorals, with 1 short, inconspicuous spine and 2-4 segmented rays. No teeth in palatines; vomerine teeth present or absent. Teeth in jaws comb-like, fixed or movable (canine teeth occasionally present). Dorsal spines 3-17, flexible; 9-119 segmented soft rays. Pectoral rays 10-18, unbranched. Caudal fin rays branched or unbranched. Two anal spines (NELSON 1994).

Blennius FORSKÅL 1775

Mainly marine fish, body elongate tentacles on nasal openings, supraorbital tentacles small or missing, jaw teeth in a single row, one canine on each side of both jaws. Vomer covered with teeth, and wide gill opening (KRUPP & SCHNEIDER 1989).

***Blennius fluviatilis* (Asso 1801)**

Diagnosis: Body elongated and without scales. Mouth subterminal, jaws with small conical teeth. Eyes are located on the dorsal side with small tentacles extending on the upper boarder. Males possess a fleshy crest on top of the head (KRUPP & SCHNEIDER 1989, MIR 1990).

Distribution: This species was collected from the East Ghor canal, 2 km east of the Jordan River (AL-ABSY & MIR 1986b).

Remarks: This species was reported from lake Tiberias and its tributaries (KRUPP & SCHNEIDER 1989).

Discussion

The freshwater fish fauna of Jordan consists of 15 species that are represented in 6 families. Five species are of Palaearctic affinities (*A. lissneri*, *B. canis*, *B. longiceps*, *C. damascina* and *N. insignis*), 5 are Afrotropical (*G. ghorensis*, *C. gariepinus*, *O. aureus*, *T. zillii* and *S. galilaeus*), 2 Indoasiatic (*H. nana* and *G. rufa*), one Mediterranean (*B. fluviatilis*), and 2 (*A. d. richardsoni* and *A. sirhani*) are considered of Tethys relicts (MIR 1990). Two species and one subspecies are considered as endemic to Jordan; *A. sirhani* in Azraq, *G. ghorensis* and *A. d. richardsoni* are confined to the Dead Sea Basin (KRUPP 1987, KRUPP & SCHNEIDER 1989, HAMIDAN & MIR 2003).

KRUPP (1987) gave an extensive treatment on the zoogeography of the freshwater fishes of the Levant. He stated that the Jordan River drainage basin is major center for speciation of several ancestors of Palaearctic affinities. Furthermore, KRUPP (1987) indicated that the fish fauna of the Jordan river extended into the Orontes, however, no movement from the opposite side occurred.

Six species of freshwater fishes have been introduced to Jordan at different occasions such as *Cyprinus carpio* (Fig. 12), *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Salmo gairdneri*, *Oreochromis niloticus* and *Mugil cephalus* (MIR 1990). These species were introduced for the purpose of aquaculture and were kept in different regions of Jordan, especially in Azraq area and along dams and permanent water courses in

the Jordan Valley. Recently, the Guppy, *Poecilia reticulata*, was recovered from the upper reaches of Zarqa River (personal field observations).

Azraq Oasis is one of the best examples showing the impact of alien species on native species. The oasis used to harbour three species of cichlids (*T. zillii*, *O. aureus*, and *S. galilaeus*), three species of cyprinids (*A. lissneri*, *C. carpio* and *B. canis*), and one species of Clariid the *C. gariepinus* (KRUPP & SCHNEIDER 1989; MIR 1990). With the continuous changes of wetland ecosystems and habitats some species survived while others demised. By now, two cichlids and two cyprinids are surviving in Azraq pools, in addition to *A. sirhani*.

The impact of these invasive species caused habitat loss and competition with *A. sirhani*. Medium sized cichlids can reach shallow water along shore lines and utilise this territory and feed directly on eggs and fry of *A. sirhani*. *A. sirhani* does not breed in deep water with very limited breeding grounds, since water level in Azraq pools fluctuate daily and causing dryness of breeding ground where most of eggs and fry are located. *A. lissneri* was found to feed on most species (*Daphnia* sp. and amphoid) that *A. sirhani* feeds. *A. lissneri* showed nocturnal activities and had more fecundity than *A. sirhani*.

Further studies on the freshwater fishes of the Jordan River system and establish a base line data on the freshwater fishes of Jordan are imperative. Ecology and biology for other native species are the focus of ongoing research.

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Zusammenfassung

Die Süßwasserfische Jordaniens. Eine Übersicht der heimischen Süßwasserfische Jordaniens wird dargestellt. Die 15 Arten in Jordanien nachgewiesenen Arten zählen zu 6 Familien (Cyprinidae, Balitoridae, Clariidae, Cyprinodontidae, Cichlidae and Blenniidae) aus 12 Gattungen. Bemerkungen zur Ökologie basieren auf aktuellen Feldbeobachtungen.

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Address of author:

Nashat HAMIDAN
The Royal Society for the
Conservation of Nature
P. O. Box 1215, Amman 11941
Jordan
E-Mail: nashat@rscn.org.jo

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