



Harold Heatwole
Indraneil Das
Susan King *Editors*

Status of Decline and Conservation of Amphibians of the Middle East

Amphibian Biology, Volume 11, Part 8
Status of Conservation and Decline
of Amphibians: Eastern Hemisphere

 Springer

Status of Decline and Conservation of Amphibians of the Middle East

Harold Heatwole • Indraneil Das
Susan King
Editors

Status of Decline and Conservation of Amphibians of the Middle East

Amphibian Biology, Volume 11,
Part 8 Status of Conservation
and Decline of Amphibians:
Eastern Hemisphere

 Springer

Editors

Harold Heatwole
Department of Zoology
University of New England
Armidale, NSW, Australia

Indraneil Das
Institute of Biodiversity
and Environmental Conservation
Universiti Malaysia Sarawak
Kota Samarahan, Sarawak, Malaysia

Susan King
58 Everett Street, NSW 2365, Guyra,
NSW, Australia

ISBN 978-3-031-68984-0 ISBN 978-3-031-68985-7 (eBook)
<https://doi.org/10.1007/978-3-031-68985-7>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2025

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.



Amphibian Fauna of Kuwait

7

Indraneil Das and Aaron M. Bauer

Contents

Introduction.....	188
The Amphibian Species.....	189
Threats and Conservation.....	191
References.....	193

Abbreviations

IUCN International Union for the Conservation of Nature
NE Not Evaluated

I. Das (✉)
Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak,
Kota Samarahan, Sarawak, Malaysia
e-mail: idas@unimas.my

A. M. Bauer
Department of Biology and Center for Biodiversity and Ecosystem Stewardship, Villanova
University, Villanova, PA, USA
e-mail: aaron.bauer@villanova.edu

© The Author(s), under exclusive license to Springer Nature
Switzerland AG 2025

H. Heatwole et al. (eds.), *Status of Decline and Conservation of Amphibians of
the Middle East*, https://doi.org/10.1007/978-3-031-68985-7_7

187

Introduction

The State of Kuwait (Fig. 7.1) lies between latitudes 28° and 31° N and longitudes 46° and 49° E and is one of the smallest countries in Asia, covering a land area of 17,818 km² and about 1000 km² of offshore islands. It is located along the northern edge of eastern Arabia, at the north-western tip of the Persian Gulf, and borders Iraq in the north and Saudi Arabia in the south. Kuwait shares maritime borders with Iran, Saudi Arabia, and Iran. Most of the country's population resides in Kuwait City, and in 2021, the nation had a population of 4.67 million people, a majority expatriates from over a hundred nations. While the export of oil dominates Kuwait's economy, starting from its commercial discovery in 1938, in historical times, it was an important port between the civilizations of Greece, the Arabian Peninsula, Mesopotamia, Persia, and India (Hannestad 1983; Al-Mishwat 2021; Nizami 1994).

A greater part of the modern-day land area of Kuwait was created during the post-glacial flooding of the Persian Gulf basin, resulting in debris from the Tigris–Euphrates delta. The country is generally low-lying, with the highest point being the Mutla Ridge, at 306 m above sea level. Additionally, Kuwait has ten islands, and with an area of 860 sq. km, Bubiyan is the largest and is connected to the rest of the country by a 2380-m bridge (Omar and Roy 2013).

Winters are cold and the rest of the year less humid than other coastal regions in the Arabian Peninsula. The spring season in March is warmer, with occasional thunderstorms. Southeasterly winds characterize July and October, while the south winds blow in spring and early summer. The Shamal is a northwesterly wind during June and July, which is responsible for sandstorms. Kuwait's summers are among the hottest on earth, recorded to reach 54°C at Mitribah (Merlone et al. 2019).

Much of the nation comprises desert; the landscape is flat, broken by low sand dunes and shallow depressions. The flora of Kuwait has been described as poor open scrub (Halwagy and Halwagy 1974) and includes 374 species in 55 families, comprising about 250 annuals, 83 herbaceous perennials, and 34 shrubs and undershrubs and one tree species (Anonymous 2000).

Kuwait is a signatory of the Ramsar Convention, and five protected areas are recognized by the IUCN. Mubarak al-Kabeer Reserve on Bubiyan Island is the country's first Wetland of International Importance. The 50,948 hectares of reserve consists of small lagoons and shallow saltmarshes and is important as a stop-over for migrating birds. No amphibians are known from the site (Amr 2021).

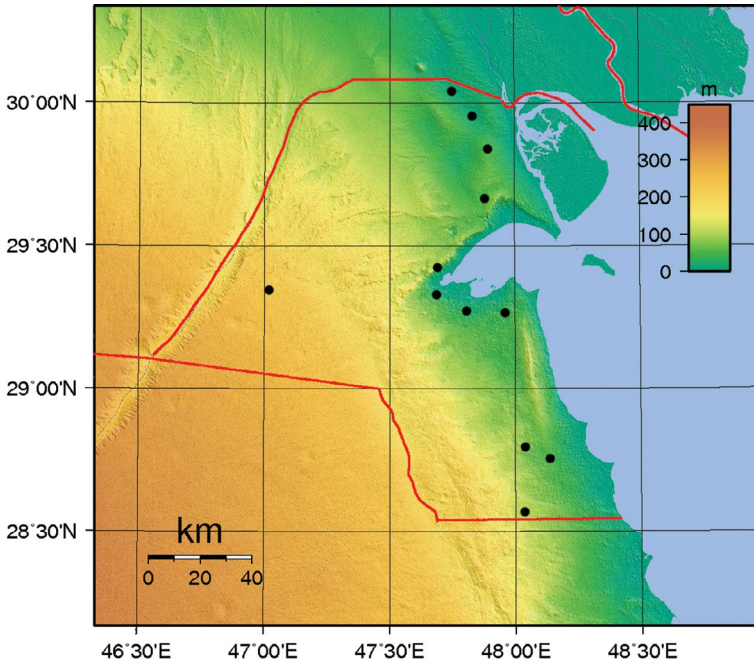


Fig. 7.1 Relief map of Kuwait, showing physiographic features (m = meters above sea level) and important localities for *Bufotes sitibundus* (dots). Important localities are: Al Wafrah 28.56 N, 48.09 E; Al Jahrah Pools 29.36 N, 47.69 E; Abdali 29.99 N, 47.74 E; Umm al Aish 29.77 N, 47.77 E; Al Ah'madi 29.0848 N, 48.07628 E; Sulaibiya Pilot Fields 29.2535 N, 47.7531 E; Bodai's Farm 29.9654 N, 47.81192 E.

Kuwait lies within a water-deficit region and relies on desalination of seawater as a primary source of freshwater for drinking and domestic purposes. There are no permanent rivers, and its non-marine wetland biodiversity is concentrated around the “wadis” (intermittently water-filled streambeds). About 0.6% of the land area is considered arable, freshwater resources being groundwater, desalinated seawater, and treated wastewater effluents. The first desalinization plant was set up in 1953, and currently, several such plants supply water for the needs of its citizens and other residents (Al Ali 2008).

The Amphibian Species

Mention of amphibians can be found in general accounts of the wildlife (e.g., Clayton 1983) or reports on herpetological surveys (e.g., Amr et al. 2021; 2022) in Kuwait, although the AmphibiaWeb (www.amphibiaweb.com) listed no species as of January 2022.

A single amphibian species is known from Kuwait. Originally referred to as *Bufo viridis* Laurenti, 1768, and more recently as *Bufotes variabilis*, the Kuwaiti example specimen has been referred to as *Bufotes sitibundus* (Pallas, 1771) (see Dufresnes

et al. 2019). This name has been applied to the eastern populations of the *Bufo* group of toads, with a range encompassing northern Sinai in Egypt, east to Israel, Lebanon, Syria, Anatolia, and the Caucasus regions to southern Russia, Kazakhstan, eastern Iraq, and western Iran (Speybroeck et al. 2020; Frost 2024). However, some recent authors continue to treat it as a subspecies or synonym of *Bufo viridis* (see Speybroeck et al. 2020; Frost 2024). It is a brightly-colored terrestrial species (Fig. 7.2). Breeding occurs in spring in the scarce bodies of fresh and brackish water (Clayton and Wells 1987).



Fig. 7.2 *Bufo sitibundus*. (Photograph by Barbod Safaei-Mahroo)

Population ecology of the species studied by Altunışık et al. (2021) in Turkey indicates a maximum life span of 10 years for males and 11 years for females; the mean age of sexual maturity is 2–4 years for both sexes. Sexual size dimorphism was absent, with individuals from higher elevations tending to be significantly larger, older, and heavier than those from lower levels. Ecological studies of the species (under various older names) have been conducted, one in Israel on its

terrestrial adaptations especially, occupancy of extremely harsh environments, owing to urea-production (Degani et al. 1984) and toleration of extreme salinity (Katz 1973). Accumulation of urea permits lowering body water potential and thereby the absorption of soil-bound water (Hoffman and Katz 1998). Sajit and Yousif (2018) reported on conditions of temperature, salinity, and pH in Safwan, Iraq, adjacent to the Kuwaiti border. Fakharzadeh and Hosseinzadeh (2021) conducted distributional modeling for the species and suggested a wider distribution than currently known.

Threats and Conservation

The scarcity of surface bodies of water is assumed to naturally affect the abundance and distribution of the species. The only significant area of non-marine wetland in the country is the Al-Jahra Pool Nature Reserve. Kuwait's sole amphibian is known to breed in the waters of these man-made pools (Amr et al. 2021), created by the effluent from Al-Jahra town flowing across sandy saline areas ("Sabkhah") to the sea. In places, it forms stagnant, shallow pools, with extensive beds of the perennial reed grass, *Phragmites australis*. There also are scattered halophytes and old plantations of the Salt Cedar, *Tamarix aucheriana*. About 70 ha are fenced, with signs stating its protection for birds (Anonymous 2020).

Sadek et al. (1995) used animals from El-Wafra District, in the far south of Kuwait, for experiments using toads as models to assay development of tumors in relation to carcinogens. Jones (1987) and Sey and Al-Ghaith (2000) reported on helminths from toads from the same locality, where toads occur in agricultural areas (Jaman and Meakins 1998). No other mention of amphibians is known in the pharmacological or parasitological literature for Kuwait. As of January 2022, *Bufo tibundus* remains unassessed for its conservation status for the IUCN Red List, and therefore needs to be allocated to the NE (Not Evaluated) category.

Article 100 of the Kuwait Environmental Protection Law + Amendment (2014, 2015), prohibits the capture, killing, or transportation of wildlife and marine organisms, and Article 253 of the said Law protects the wildlife of Kuwait, with the Environmental Public Authority of the State of Kuwait being tasked with its implementation. While amphibians are not specifically covered, the frog motif has been recognized postally as relevant to environmental conservation: on 16 September, 1997, Kuwait Post issued a set of three stamps (Stanley Gibbons catalogue numbers 1526–1528; see Fig. 7.3), each of which depict a stylized frog on the 25 fil, 50 fil,



Fig. 7.3 **Upper:** Frogs among other elements of biodiversity depicted on postage stamps issued from Kuwait in 1997 for the tenth Anniversary of the Montreal Protocol; **Lower:** Close-up of the central design of the stamps above showing an unidentified frog at the tip of the red arrow (probably *Hyla* sp., extralimital to Kuwait). A similar design was issued by the Kingdom of Bahrain to commemorate the event. (Photographs by the senior author)

and 150 fil stamps commemorating the tenth Anniversary of Montreal Protocol (on reduction of use of chlorofluorocarbons).

Several strategic responses have been listed in the country's biodiversity policies (Anonymous 2000), including public awareness of bioresources and their importance, development of skills and expertise in biodiversity research, protection and enhancement of habitats, and the monitoring and protection of populations.

Acknowledgments We thank Harold Heatwole for inviting us to write this chapter, to Barbod-Mahroo and Hanyeh Ghaffari for Fig. 7.2, and to Susan King for formatting Fig. 7.3.

References

- Al Ali, E.H., 2008. Groundwater history and trends in Kuwait. *Transactions on Ecology and the Environment*, **112**: 153–164. <https://doi.org/10.2495/SI080161>.
- Al-Mishwat, A.T., 2021. Faydhat Nayif archaeological site, AsSubbiyah, Kuwait: a discovery of an ancient blacksmith village along the north shore of the Kuwait Bay, Kuwait. *Archaeological Discovery* 9: 165–184. <https://doi.org/10.4236/ad.2021.93009>.
- Altunışık, A., Gül, S. and Özdemir, N., 2021. Impact of various ecological parameters on the life-history characteristics of *Bufo viridis sitibundus* from Turkey. *Anatomical Record* **304**: 1745–1758. <https://doi.org/10.1002/ar.24571>.
- Amr, Z.S., 2021. *The State of Biodiversity in Kuwait*. IUCN; the State of Kuwait, Kuwait: Environmental Public Authority, Gland, Switzerland. xx + 248 pp.
- Amr, Z.S., Alenezi, A.A.-S. Al-Sayegh, M.T. and Abu Baker, M.A., 2021. Reptiles and amphibians of the State of Kuwait. *Bonner Zoological Bulletin* **70**: 253–272.
- Amr, Z. A., Alenezi, A. A., Al-Zaidan, A. and Abu Baker, M. A., 2022. *Reptiles and Amphibians of the State of Kuwait*. Gland, Switzerland: IUCN, Gland, and Environment Public Authority, State of Kuwait, Kuwait. xi + (ii) + 138 pp.
- Anonymous, 2000. *The National Biodiversity Strategy for the State of Kuwait*. Environment Public Authority of the State of Kuwait, Kuwait. 50 pp.
- Anonymous, 2020. *Key Biodiversity Areas factsheet: Al-Jahra Pool Nature Reserve*. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Downloaded from <http://www.keybiodiversityareas.org/> on 15/12/2021.
- Clayton, D., (Ed.), 1983. *Kuwait's Natural History: An Introduction..* Kuwait Oil Company, Kuwait. viii + 351 pp.
- Clayton, D. and Wells, K., 1987. *Discovering Kuwait's Wildlife*. Fahad Al-Marzouk, Kuwait. [x] + 253 pp.
- Degani, G., Silanikove, N. and Shkolnik, A., 1984. Adaptation of green toad (*Bufo viridis*) to terrestrial life by urea accumulation. *Comparative Biochemistry and Physiology Part A Physiology* **77**: 585–587. [https://doi.org/10.1016/0300-9629\(84\)90233-0](https://doi.org/10.1016/0300-9629(84)90233-0).
- Dufresnes, C., Mazepa, G.O., Jablonski, D., Oliveira, R.C., Wenseleers, T., Shabanov, D.A., Auer, M., Ernst, R., Koch, C., Ramirez-Chaves, H.E., Mulder, K.P., Simonovo, E., Tiutenko, A., Kryvokhyzhar, D., Wennekes, P.L., Zinenko, O.I., Korshunov, A. V., Al-Johany, A.M., Peregontsev, E.A., Masroor, R., Betto-Colliard, C., Denoël, M., Borkin, L.J., Skorinov, D.V., Pasyukova, R.A., Mazanaeva, L.F., Rosanov, J.M., Dubey, S. and Litvinchuk, S.N., 2019. Fifteen shades of green: The evolution of *Bufo* toads revisited. *Molecular Phylogenetics and Evolution* **141**: 1–25.
- Fakharzadeh, F. and Hosseinzadeh, M.S., 2021. Overview of taxonomy and prediction [of] potential distribution of *Bufo sitibundus* (Anura: Bufonidae) using environmental factors. *Journal of Wildlife and Biodiversity* **5**: 21–34.
- Frost, D. R. 2024. Amphibian Species of the World: an Online Reference. Version 6.2 (Date of access: 18 December 2024). Electronic Database accessible at <https://amphibiansoftheworld.amnh.org/index.php>. American Museum of Natural History, New York, USA. <https://doi.org/10.5531/db.vz.0001>
- Halwagy, R. and Halwagy, M., 1974. Ecological studies on the desert of Kuwait II. The vegetation. *Journal of the University of Kuwait (Science)* **1**: 87–94.
- Hannestad, L., 1983. The Hellenistic pottery from Failaka. *Jysk Arkæologisk Selskab* **16**, 7–128.
- Hoffman, J. and Katz, U., 1998. Glyconeogenesis and urea synthesis in the toad *Bufo viridis* during acclimation to water restriction. *Physiological and Biochemical Zoology* **71**: 85–92.

- Jaman, S. K. and Meakins, R.H., 1998. *Biodiversity of Animals in Kuwait*. Center for Research and Studies on Kuwait, Almansouria, Kuwait. 215 pp.
- Jones, M.K., 1987. A taxonomic revision of the Nematotaeniidae Lühe, 1910 (Cestoda: Cyclophyllidae). *Systematic Parasitology* **10**: 165-245.
- Katz, U., 1973. Studies on the adaptations of the toad *Bufo viridis* to high salinities: oxygen consumption, plasma concentration and water content of the tissues. *Journal of Experimental Biology* **58**: 785–796.
- Merlone, A., Al-Dashti, H., Faisal, N., Cervený, R., Al Sarmi, S., Bessemoulin, P., Brunet, M., Driouech, F., Khalatyan, Y., Peterson, T.C., Rahimzadeh, F., Trewin, B., Wahab, M., Yagan, S., Coppa, G., Smorgon, D., Musacchio, C. and Krahenbuhl, D.S., 2019. Temperature extreme records: World Meteorological Organization metrological and meteorological evaluation of the 54.0°C observations in Mitribah, Kuwait and Turbat, Pakistan in 2016/2017. *International Journal of Climatology* **39** (656): <https://doi.org/10.1002/joc.6132>.
- Nizami, K.A., 1994. Early Arab contact with South Asia. *Journal of Islamic Studies* **5**: 52–69.
- Omar, S.A.S. and Roy, W.Y., 2013. *Ecology and environment of Boubyan Island in Kuwait*. Kuwait Institute of Scientific Research, Kuwait. xxvi + 292 pp.
- Pallas, P.S., 1771. *Reise durch verschiedene Provinzen des Russischen Reichs*. Theil 1. St. Pétersbourg: Gedruckt bey der Kayserlichen Academie der Wissenschaften. 12 + 504 pp; 6 pl.
- Sadek, I., Abdel-Salam, F. and Al-Qattan, K., 1995. Chemopreventive effects of cabbage on 7,12-Dimethylbenz(a)-Anthracene-induced hepatocarcinogenesis in toads (*Bufo viridis*). *Journal of Nutritional Science and Vitaminology* **41**: 163–168.
- Sajit, M.J. and Yousif, U.H., 2018. Temporal occurrence of the toad *Bufo viridis* (aurenti [sic], 1768) in desert harsh terraria at Safwan-south Iraq. *Marsh Bulletin* **13**: 1–12.
- Sey, O. and Al-Ghaith, L., 2000. Helminths of green toads *Bufo viridis* Laurenti, 1789 [sic] and spiny tailed lizards, *Uromastix microlepis* Blanford, 1874 of Kuwait. *Miscellanea Zoologica Hungarica* **13**: 21–27.
- Speybroeck, J., Beukema, W., Dufresnes, C., Fritz, U., Jablonski, D., Lymberakis, P., Martínez-Solano, Í., Razzetti, E., Vamberger, M., Vences, M., Vörös, J. and Crochet, P.-A., 2020. Species list of the European herpetofauna—2020 update by the Taxonomic Committee of the Societas Europaea Herpetologica. *Amphibia-Reptilia* **41**: 139–189 <https://doi.org/10.1163/15685381-bja10010>