

ARTICLE

Population Status, Threats and Conservation of the Spotted Pond Turtle; *Geoclemys Hamiltonii* (Gray, 1830) (Geoemydidae) of Pakistan

Amtiyaz Safi^{1*} Muhammad Zaheer Khan¹ Roohi Kanwal¹ Hans-Volker Karl²

1. Department of Zoology (Wildlife Section), University of Karachi, Karachi-75270, Pakistan.

2. Friedrich-Schiller-University of Jena, Dpt. Pre-historic and Early historic Archeology, Löbdergraben 24a, 07743 Jena, Germany.

ARTICLE INFO

Article history

Received: 2 February 2021

Accepted: 11 March 2021

Published Online: 31 March 2021

Keywords:

Population status

Threats

Conservation

Geoclemys hamiltonii

ABSTRACT

In the present work on population status, threats and conservation of the spotted pond turtle; *Geoclemys hamiltonii* (Gray, 1830) (Geoemydidae) was conducted in Thatta, Sujawal and Badin districts of Sindh province of Pakistan. A total number of 277 live specimens of *G. hamiltonii* from southeast province (Sindh) of Pakistan have been collected from different water bodies and sites in three consecutive year's i.e 2015-2017. The population status of *G. hamiltonii* has recorded as decreasing in Sindh due to habitat destruction, eutrophication, agricultural farming and some other anthropogenic activities. This species is mostly used as pet and the poachers mostly carrying this species for trade in East Asian countries. The globally illegal trading hubs of this species are Bangkok, Taiwan and Hong Kong. More and powerful actions and efforts are needed to raise awareness of smuggling of wildlife, with a specific need of formal memorandums of understanding (MOUs) are strongly encouraged south Asian and east Asian countries to control illegal trade between the countries and territories along the trade route of Bangladesh, India, Pakistan, Thailand, Hong Kong and Taiwan to improve cross border enforcement.

1. Introduction

Pakistan is indeed very fertile in its reptile diversity. The varied and interesting composition of the herpeto-fauna of Pakistan is rich due to the peculiar zoogeographical position of Pakistan which lies at the transitional zone among three zoo-geographical regions i.e. Palearctic, Ethiopian and Oriental regions among world's six regions. There are two families, six genera and eight species of freshwater turtles found in Pakistan, six of which are threatened, and all species are listed in CITES Appendices

I / II ^[1]. Globally, more than 50 percent of freshwater turtles are fighting a race against extinction. Found in rivers, lakes and ponds, freshwater turtles are threatened by the illegal trade for their meat and the demand for them as pets. The smuggling and illegal trafficking of freshwater turtles and tortoises and their body parts for trade in Asia is a major threat for these reptiles. This illegal and unsustainable wildlife trade for meat, traditional medicine and as pets is dire conservational threat for the survival of the endangered species. The protection and conservation of reptiles has been receiving attention in recent years, but

*Corresponding Author:

Amtiyaz Safi,

Department of Zoology (Wildlife Section), University of Karachi, Karachi-75270, Pakistan;

Email: amtyaz.safi@gmail.com

they still need strict legal protection and restoration of natural reservoir in which they live for better survival. A spate of recent significant seizures suggests that trade of the Black Spotted Turtle *G. hamiltonii* has escalated rapidly over the past few years and needs closer monitoring and enforcement actions as a priority basis [2-8]. The *Geoclemys hamiltonii*, is a species of freshwater turtle endemic to South Asia. This species can be readily identified due to its spotting on body. It belongs to the monotypic genus *Geoclemys* and is crepuscular, meaning they are most active at twilight (dusk and dawn). This species is listed as Vulnerable in the red list of IUCN [9] and is listed as Appendix I in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), which means that all types of trading of this turtle is illegal and in violation of the Convention. As listed in Appendix I of CITES, this species is protected within all range by south Asian countries by the legislations (Box 1) [2, 5, 6, 10]. Live specimens of *G. hamiltonii* from southeast province (Sindh) of Pakistan have been collected from different water bodies and sites in three consecutive year's i.e 2015-2017. The collected *G. hamiltonii* specimens were thoroughly examined the data of population status of *G. hamiltonii* in Sindh during the current study.

Box 1. National legislation protecting the Black Spotted Turtle

***Pakistan:** This turtle is protected under Schedule III of the provincial (KPK) Wildlife Act (1975) and Punjab Wildlife Act (1974). There is a federal ban on the export of all wild mammals, reptiles, and protected indigenous birds under the Export Trade Control Order (1981). Ratified CITES in 1976.

***India:** This species is protected under Schedule I of the Wildlife Protection Act (1972). Violation of CITES is regarded as a violation of the Import and Export Policy and is dealt with under the Customs Act. Ratified CITES in 1976.

***Bangladesh:** Protected under Schedule III of the Wildlife (Preservation) Act (1974). Ratified CITES in 1981.

***Nepal:** All export of wildlife and wild animal parts totally banned since 1992. Violation of CITES is regarded as a violation of the Export and Import (Control) Act 1957 and the Customs Act 1962. Ratified CITES in 1975.

2. Materials and Methods

The present study has been conducted in the southeast-

ern districts of Sindh (Thatta, Sujawal and Badin) of Pakistan. The study was carried out in different seasons and in different water bodies of the studied districts with the aim to record the population status and distribution along with pointing out threats and conservational needs of the *G. hamiltonii*. Surveys were carried out randomly throughout the selected water bodies in different seasons and in different spots. The turtles were searched out in riverine areas and in different habitat conditions such as bushes, under leaf litters, logs, Hill stream beds, in crevices, In gaps of rocks and trees, in gaps in roots of large trees, in sun basking spots, in swimming condition and in hibernating form. Turtles under sun basking and swimming were observed from a distance by using binoculars from boat or by walking along the river/water bodies sides. The local fishermen, farmers and other local communities of studied areas were interviewed using standard photos of *G. hamiltonii*.

3. Results

3.1 Systematic Position

Taxon Name: *Geoclemys hamiltonii* (Gray, 1830)

Synonym(s):

- *Clemmys palaeindica* Lydekker, 1885
- *Emys guttata* Gray, 1831
- *Emys hamiltonii* Gray, 1830
- *Emys picquotii* Lesson in Dumeril & Bibron, 1835
- *Emys piquotii* Lesson, 1835
- *Emys hamiltonoides* Falconer & Cautley in Lydekker, 1880

• *Geoclemys sivalensis* Tewari & Badam, 1969

• *Melanochelys pictus* Murray, 1884

Common Name(s):

- English: Spotted Pond Turtle, Black Pond Turtle, Black Spotted Turtle, Hamilton's Terrapin
- French: Géoclemmyde d' Hamilton, Tortue de Hamilton
- Spanish: Galápago Rayado
- German: Strahlen-Dreikielschildkröte

3.2 Geographic Range

Range Description:

G. hamiltonii inhabits the lowlands of the Indus, Ganga and Brahmaputra River basins.

Country Occurrence:

Pakistan (Punjab, KPK and Sindh province), Bangladesh, Nepal and India.

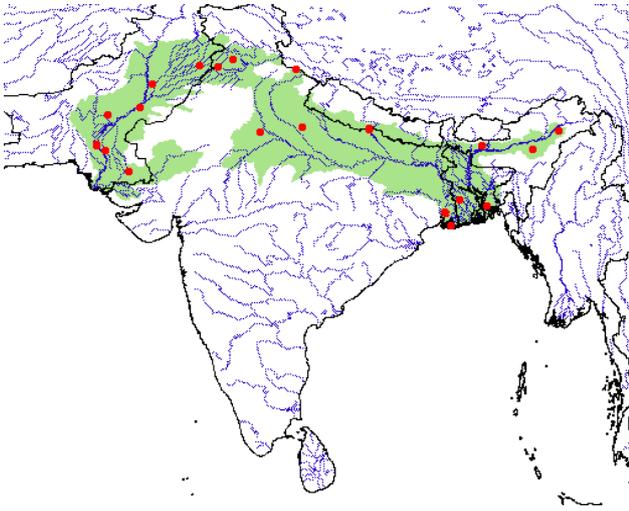


Figure 1. Distribution map of *G. hamiltonii*. Red points refer to locality records and the green shaded area is the projected distribution.

3.3 Morphology

The family of hard shelled turtles, Geoemydidae consists of highly endangered species of South-east Asia^[6, 11]. *G. hamiltonii* is mainly black with small yellowish spots on body, and a much elevated carapace, with three interrupted keels of nodose prominence corresponding to the vertebral and costal shields. The border of the posterior carapace is sharply serrated in juveniles, but feebly in the adult ones. The nuchal is medium size and broader posteriorly. The first vertebral is not broader anteriorly. The second and third vertebrae are broader in young. The plastron is larger, angulate laterally, truncate anteriorly. The posterior lobe of the plastron is much narrower than the opening of the shell, nearly as long as the width of the bridge deeply notched posteriorly. The snout is very shorter. The upper jaw is emarginated medially. The width of the mandible at the symphysis nearly same in size to the horizontal diameter of the orbit. A large shield covers the crown and upper surface of the snout, sometimes divided into three, one shield around the upper jaw and one on each side between the eye and the ear. The digits are webbed to the claws. The tail is very short. The shell is blackish or darkish brown, elegantly marked with yellow spots and radiating streaks, and the soft parts are dark brown or blackish, with round yellow spots, largely on the neck and head^[12].



Plate 1. Dorsal view of *Geoclemys hamiltonii* in a natural environment.

3.4 Habitat and Ecology

G. hamiltonii prefers shallow, densely vegetated standing water bodies, but may also occur in rivers, ponds and other water reservoirs and basks preferentially in reed beds. This species apparently feeds mostly on snails, taking also dragonfly larvae and other insects, freshwater crustaceans and a wide range of other vegetation and animal's food items^[13-16].

Pond turtles bask in the sun to regulate their body temperature. At times, they will gather and rest on vegetation (Either on water or on land). In the summer, in areas where their usual water source dries up, they undergo a short migration to move into wells in the river bed. They are able to dig quite deep to reach these sites.

They prefer water with thick vegetation that provides cover, as well as places to lie and bask. In the summer, pond turtles remain mostly submerged in the water. They may be seen poking their heads out of the water for long periods of time. During the winter, they rest under bushes, dry vegetation, water reeds and dry leaves.

They gain sexual maturity in 6-8 years. Females dig a bowl shaped nest for their eggs that is about 6-10 centimeters deep. The nest is dug into loamy soil in a spot where it will be concealed by bushes and other vegetation.

3.5 Current Population Trend

The current population trend in the world as well as in Pakistan is decreasing. A total number of 277 live specimens of *G. hamiltonii* from southeast province (Sindh) of Pakistan have been collected from different water bodies and sites in three consecutive years i.e 2015-2017 as shown in Table 1-3; Figure 1-3. The collected *G. hamiltonii* specimens were thoroughly examined during this study (Table 1-3; Figure 1-3). The captured and collected specimens were identified and counted.

Table 1 and Figure 1 display the data of population status of *G. hamiltonii* in Thatta district for years 2015, 2016 and 2017. The data explain the increase in population in

Keenjhar lake, Jubho Lagon and MirPur Sakro Canal. While the decrease in the population has been seen in the localities of Haleji Lake, Karo dhand, Barrage Mori and Ghora Bari fish farm area.

Table 1. Comparative Status of *Geoclemys hamiltonii* in Localities of District Thatta in year 2015, 2016 and 2017.

Localities	2015	2016	2017
Keenjhar Lake	19	24	33
Haleji Lake	16	22	05
Hadero Lake	25	04	24
Mehboob Shah Dhand	13	32	04
Karo Dhand	16	04	06
Jubho Lagoon	19	23	32
Chabo Mori	05	04	05
Barrage Mori	12	02	04
MirPur Sakro Canal	31	34	43
Ghora Bari Fish Farm	26	32	03
Deh Janghisar	13	13	02

status of *G. hamiltonii* in Sujawal district for years 2015, 2016 and 2017. The data explain the increase in population in Jhal Dhand and Badh Mori. While the decrease in the population has been recorded in the Their Dhand and Guni mori reservoir.

Table 2. Comparative Status of *G. hamiltonii* in Localities of District Sujawal in year 2015, 2016 and 2017.

Localities	2015	2016	2017
Theri Dhand	13	35	12
Thari Dhand	10	06	16
Othko Dhand	12	28	14
Amerji Dhand	06	36	06
Jhal Dhand	16	22	26
Guni Mori	31	44	14
Fish farm Badh Mori	13	36	38

Table 2 and Figure 2 display the data of population

Table 3 and Figure 3 show the data of population status of *G. hamiltonii* in Badin district for years 2015, 2016 and 2017. The data explain the increase in population in Jaffar Ali Lake, Tando Bago and Rajo Khanani Dhand While the decrease in the population has been recorded in the Phoosna Lake, Adhalo Farms, Fuleli Ghani Dhand and Rice field Matli area.

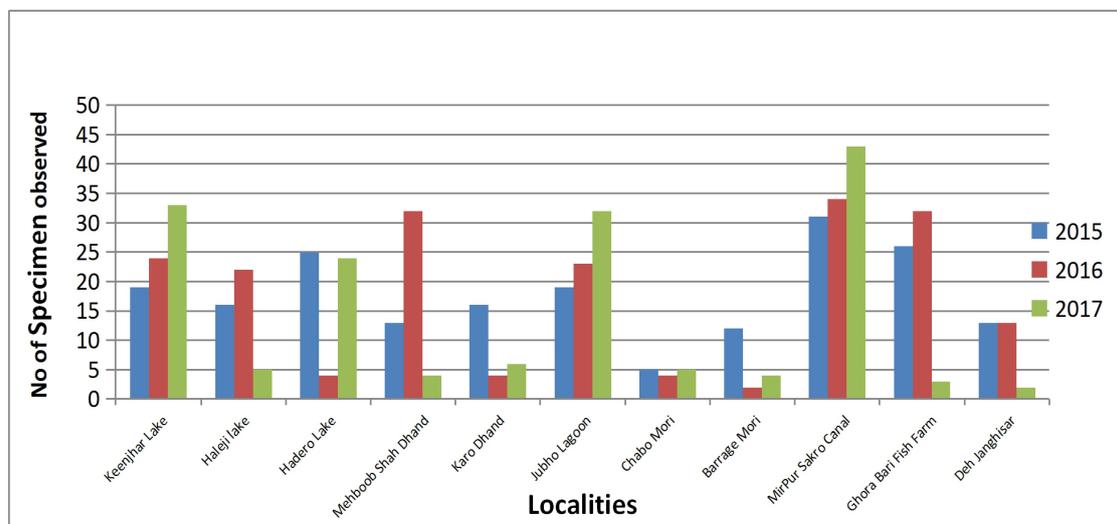


Figure 1. Comparative Status of *Geoclemys hamiltonii* in Localities of District Thatta in year 2015- 2017.

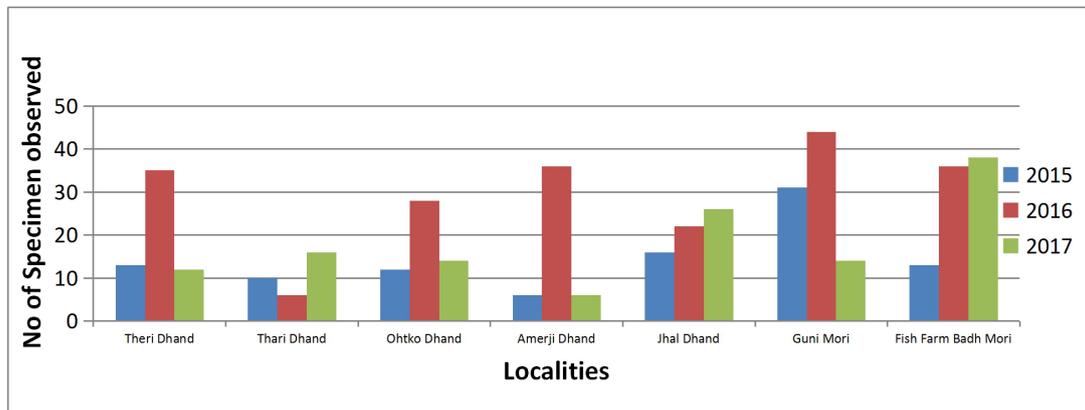


Figure 2. Comparative Status of *G. hamiltonii* in Localities of District Sujawal in year 2015- 2017.

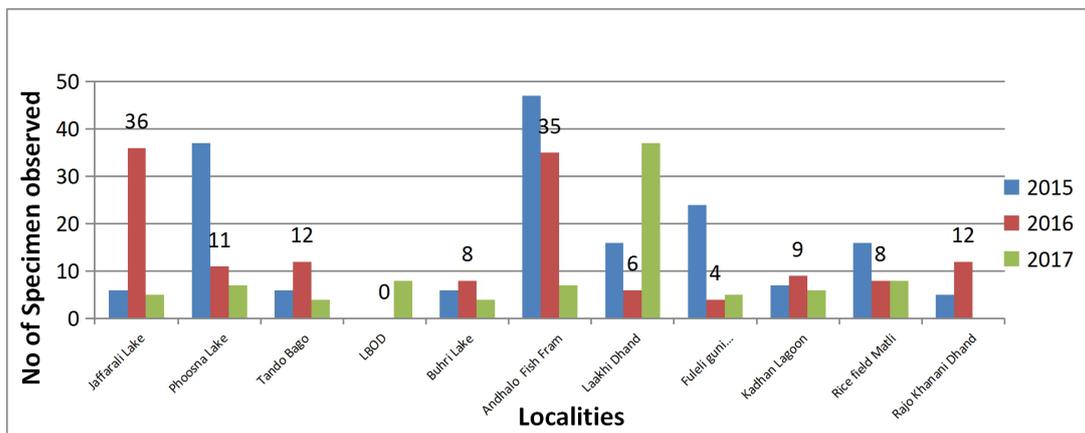


Figure 3. Comparative Status of *G. hamiltonii* in Localities of District Badin in year 2015- 2017.

Table 3. Comparative Status of *Geoclemys hamiltonii* in Localities of District Badin in year 2015, 2016 and 2017.

Localities	2015	2016	2017
Jaffar Ali Lake	06	36	36
Phoosna Lake	37	11	11
Tando bago	06	12	12
LBOD	00	00	00
Buhri Lake	06	08	08
Andhalo Fish farm	47	35	35
Laakhi Dhand	16	06	06
Fuleli Guni Dhand	24	04	04
Kadhan Lagoon	07	09	09
Rice field Matli	16	08	08
Rajo Khanani Dhand	05	12	12

4. Discussions

Data on population status of *G. hamiltonii* are highly variable, with the species considered common in several protected locations and reported as uncommon or rare at some sites,^[17] While some workers considered the species rare^[18] and some considered the species common in the Brahmaputra (India) floodplains and rare elsewhere, and rated its population as apparently stable in India. By 2011, this situation was understood to have continued with populations still in good shape in protected areas, but rarely found outside. It is nearly extirpated outside protected areas in Assam^[19].

In Bangladesh, the species was considered rare after an abrupt population decline in the past 20 years and total disappearance from extensive parts of its range in Bangladesh^[20]. By 2011, the species was considered to be more threatened than previously thought and estimated to have lost at least half its population since 1980, qualifying nationally as Endangered.

In Pakistan,^[21] some workers reported the species as ‘frequent’ in the five major rivers of the Punjab region,

relative to other sympatric freshwater turtle species.

While some^[22] recorded *G. hamiltonii* as rare in KPK province and frequent in Sindh province in Pakistan.

Participants of the 2018 Tortoises and Freshwater Turtles of Tropical Asia Red List Workshop in Singapore agreed that all available evidence points toward a substantial shrinkage of the range of *G. hamiltonii* and a decline of many but not all subpopulations within the remaining range through exploitation and habitat loss. This decline has recently accelerated, and ongoing decline across its range is estimated to exceed 50% since about 1980 (two generations at 20 years generation length). The Black Spotted Turtle is widely distributed from Pakistan through north India and up to Nepal and Bangladesh (Figure 1). Lay eggs in two clutches of 18-30 eggs each year^[14].

The species has been reportedly sought after for use as pets and meat for local as well as globally^[14, 23]. Prior trade of *G. hamiltonii* as pets was largely exported to USA and Western-Europe^[24]. Hundreds of Black Spotted Turtles were seized during 2006-2009 market surveys at the Chatuchak Market, Bangkok, increasing from two in August 2006 to a high of 28 in June 2009^[25]. Some are also caught for consumption of the meat^[23] which traditionally centered in east India but in recent years Black Spotted Turtles have been observed in some meat markets in China^[14]. In Pakistan,^[21] some researchers reported the species as 'frequent' in the five major rivers of the Punjab region, relative to other sympatric freshwater turtle species

In Pakistan, turtle trade is up to its peak, although several conservational efforts have been made by Government and nongovernmental organizations but due to increase in international demands, traders approach the native people to capture and sell turtles to them. This trade affects all the species of turtles but specifically the soft shell turtles face decline in population due to overhunting. Soft shell turtles are more valuable because of their demand in food industry.

In the category of hard shell turtles, the most demanded species is *G. hamiltonii* (Black spotted turtle). Its export has increased in last few years. Pakistan is one of the main suppliers of freshwater turtles along with Bangladesh and India while the major markets that receive these shipments are China, Thailand, Bangkok, and Indonesia^[7]. Spotted Pond Turtle species are the genotype for the monotypic genus "*Geoclemys*". Its scientific name "*G. hamiltonii*" is in honor of Scottish Botanist and ichthyologist Mr. Francis Hamilton.

4.1 Threats to Spotted Pond Turtle

During the current study, we have observed the follow-

ing common threats to these turtle's population.

- Use in Trade

G. hamiltonii was widely collected for local and international trade. This species appeared first in the Asian food trade^[26]. The species has become highly popular in the East and Southeast Asian pet trade since about 2006 and continues to be extensively traded illegally. Well over 11,400 live specimens, in at least 70 shipments, were reported as seized from illegal trade during the period 2000-2015, the fifth most numerously seized CITES-listed turtle species^[27]. In 2011-2015, there were 4,000 juveniles of this species confiscated in India. In 2017, 1,500 of this species were confiscated^[28].

- Accidental Killings

Accidental killings of turtles are also common by capturing in nets while sometimes they were killed by fishermen for protection of their fishes as they are considered as fish enemy. Accidental capture, entanglement and drowning in fishing nets and destruction of nesting habitat have also been noted as impacts.

- Lack of Awareness

We noticed the lack of knowledge about conservation of wildlife including terrapins in local communities.

- Poor implementation of wildlife Act

The foremost threat to terrapins is uncontrolled poaching and poor implementation of wildlife (Protection, Preservation, conservation and management Act, 1975) of Sindh province. Due to this reason, poaching and capturing of turtles in a large number is common. They are illegally supplied to foreigners (for consumption, medicine and Pet trade) and their export to South Asia is in normal practice.

- Natural habitat destruction

Natural habitat destruction (damming and channeling of rivers, logging, slash and burn agriculture to population). Natural habitat loss is one of the major threats to terrapins as during in Mon soon season (July to September). Often wandering turtles fall in to the hands of uncaring people who may pelt them with stones just for fun.^[13, 14] suspected that human agricultural land use pressures on standing water bodies along the major river systems have affected the species.

- Urbanization

Urbanization and development of road networks along the wetlands is another threat.

- Local consumption

Some locals especially some nomadic tribes eat turtles and their eggs.

- Predators

Stray dogs, cats, crow, monitor lizards and kites were observed wondering extensively during canal closure in

search of food. These animals eat the eggs, new hatchlings and turtles.

- De siltation

De siltation of canals and rivers is another cause of killing of turtles during hibernation because hibernated turtles have been carried out from their natural habitat along with the silt which leads to high mortality ratio of turtles. During the closures of canals, turtles faced a shortage of water as well as scarcity of food resources which results in a population decline.

- No protection

Nesting sites of terrapins are not protected.

- Unsustainable fishing

Fishermen also use different unsustainable and brutal methods like adding pesticides to water, using electric currents to stun the fish and blowing dynamite. This is also a reason that the population of terrapins are decreasing from the area.

- Lack of awareness

Lack of awareness about the role of turtles in aquatic ecosystems.

- Poverty

Poverty and unemployment.

- Unavailable Data

For a variety of reasons few detailed quantitative data on the demand for turtles in Asia are available:

(1) The majority of the trade transactions are not recorded, and if they are recorded then often is no discrimination between different species.

(2) Often species are identified incorrectly, while others are completely unknown.

(3) Turtle parts and products in trade are often unrecognizable.

(4) Shipments are often falsely labeled as “seafood”.

(5) Generally turtles destined for consumption are sold alive or butchered at food markets. In addition, turtle parts, such as plastrons, carapaces, bile, blood etc., and manufactured products are sold for their use in traditional medicine. The shell, which is made into a jelly by prolonged boiling in water, is especially valued.

4.2 Priority Actions for Conservation Measurements

Geoclemys hamiltonii is included in CITES Appendix I, prohibiting all forms of international commercial trade.

- Status and distribution surveys are needed throughout the range of the species, with emphasis on occurrence in protected areas.

- Re-introduction or population augmentation with captive-bred or release of confiscated specimens may be considered.

- The illegal trade in this species must be addressed through a combination of enforcement of existing laws and regulations, improvement of pertinent laws in destination countries, and consumer awareness programs in destination countries. To prevent their impending extinction immediate action is required.

- Studies of ecology and life history and population dynamics are needed. Monitoring and assessment of ecological changes need to be doing on regular bases.

- Greater vigilance at known gateways especially international airports in required. Improved prosecution procedures and stronger penalties by legal and prosecution systems are required as effective deterrents.

- Media coverage of seizures not only raises public awareness of the issue but may also deter potential smugglers and improve the morale of law enforcement agencies.

- Furthermore, timely and detailed reporting to CITES Management Authorities and the CITES Secretariat is recommended to provide a more complete data set to the international conservation community that is crucial for more accurate analyses.

- As the Internet is a dominant market for illicit wildlife trade. Raising awareness about the issue both to targeted audiences such as amongst airlines and airport staff, and to the general public is recommended.

- Wildlife crime hotlines in each country should be publicized at trade hotspots such as airports so that members of the public can report any suspicious incidents to relevant authorities.

- Natural habitat destruction and alteration, harmful and unsustainable fishing techniques may be avoided.

- The legislation banning the trade in turtles should be implemented in its true letter and spirit.

- Department of Wildlife department and Department of Fisheries should control poaching of turtles and their mortality in fishing nets.

- Turtle farming practices need to be initiated to reduce the hunting pressure.

- Awareness among the local masses should be created about the conservation and importance of biodiversity in ecosystems including turtles.

- Community should be encouraged to participate in the protection/conservation and management affairs about wildlife.

- There is a dire need for the development of policy for the conservation and sustainable use of reservoir’s resources. Therefore, a comprehensive reservoir management plan must be developed and implemented without any further delay.

- Public awareness, media campaign and other sim-

ilar activities can result in the sustainable utilization of wildlife and resources of the reservoir. Sign boards highlighting significance of wildlife of the reservoir should be placed on public places, roads and important ways.

- Efforts to address subsistence consumption, through education and alternative protein provision, are likely necessary.

5. Conclusions

It is concluded from current study that due to habitat destruction, eutrophication and other anthropogenic activities, the population of *G. hamiltonii* is on the decrease. The freshwater turtles are important part of our ecosystems and need attention for their conservation and management including control over trading activities. Further studies are needed to collect more data for preparing the conservation and management plan for *G. hamiltonii* in Pakistan. There is a need to increase public awareness to enhance public participation in conservation activities particularly directed towards freshwater turtles and their habitats.

Acknowledgments

We are thankful to all members of Wildlife group (Wildlife Section, Dept. of Zoology, KU) for their support.

References

- [1] Khan MZ., Kanwal R., Ghalib SA., Fatima F., Zehra A., Siddiqui S, Yasmeen G., Safi A., Hashmi MUA., Hussain B., Iqbal MA., Manzoor U. and Ubaid Ullah. (2016), A review of distribution, threats, conservation and status of freshwater turtles in Sindh. Canadian Journal of Pure and Applied Sciences. 10(3): 3997-4009.
- [2] Broad, S., Mulliken, T. and Roe, D. (2003). The nature and extent of legal and illegal trade in wildlife. In: Oldfield, S., (Ed), The trade in wildlife. Regulation for conservation. London, Flora and Fauna International, Resource Africa and TRAFFIC International. pp 3-22.
- [3] McNeely, J. A., Kapoor-Vijay, P., Zhi, L. et al. (2009). Conservation biology in Asia: the major policy challenges. Conservation Biology 23:805-810.
- [4] Nijman, V. (2010). An overview of international wildlife trade from Southeast Asia. Biodiversity and Conservation 19(4):1101-1114.
- [5] Compton, J. (2000). An Overview of Asian Turtle Trade. In: van Dijk, P. P., Stuart B. L. and Rhodin, A. G. J. (Eds), Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia, Phnom Penh, Cambodia, 1-4 December 1999. Chelonian Research Monographs 2, Chelonian Research Foundation, Lunenburg, Massachusetts, USA, pp 24-29.
- [6] Van Dijk, P. P., Stuart, B. L. and Rhodin, A. G. J. 2000. (Eds) Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs 2, Chelonian Research Foundation, Lunenburg, Massachusetts, USA.
- [7] Gong, S. P., Chow, A. T., Fong, J. J. and Shi, H. T. (2009). The chelonian trade in the largest pet market in China: scale, scope and impact on turtle conservation. Oryx 43:213-216.
- [8] Lyons, J. A., Natusch, D. J. D. and Shepherd, C. R. (2013). The harvest of freshwater turtles (Chelidae) from Papua, Indonesia, for the international pet trade. Oryx 47:298-302.
- [9] IUCN (2021) IUCN Red List of Threatened Species. Version 2021. www.iucnredlist.org (Accessed 2 February, 2021).
- [10] www.trafficj.org
- [11] Safi, A., Khan, M.Z., Hashmi, MAU., Kanwal R and Karl H.V. 2020. Some aspects of Morphometry, Systematics and Bio-geography of the Freshwater Turtles, Pangshura (Testudines: Geoemydidae) of Pakistan. Journal of Environmental sciences. 2(1) (2020): 26-35.
- [12] www.wikipedia.org
- [13] Das, I., (1995), Turtles and tortoises of India. World Wide Fund for Nature- India. Bombay: Oxford University Press, pp.176.
- [14] Das, I. and Bhupathy, S. (2010). *Geoclemys hamiltonii* (Gray 1830) – Black Spotted Turtle, Black Pond Turtle. In: In: Rhodin, A. G. J., Pritchard, P. C. H., van Dijk, P. P., Saumure, R. A., Buhlmann, K. A., Iverson, J. B., and Mittermeier, R. A. (eds). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 5. Chelonian Research Foundation, Lunenburg, Massachusetts, USA, pp 043.1-043.6. doi:10.3854/crm.5.043.hamiltonii.v1.2010.
- [15] Minton SA. (1966), A contribution to the Herpetology of West Pakistan. Bull. Amer. Mus. Nat. Hist. 1966; 134: 29-184.
- [16] Rashid, S.M.A. and Swingland, I.R. 1997. On the ecology of some freshwater turtles in Bangladesh. In: J. Van Abbema (ed.). Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles An International Conference New York Turtle and

- Tortoise Society, New York: 225-242.
- [17] Das, I. 1991. *Colour Guide to The Turtles and Tortoises of the Indian Subcontinent*. R&A Publishing Ltd, Postishead, U.K.
- [18] Choudhury B.C., Bhupathy, S. and Hanfee, F. 2000. Status information on the tortoises and freshwater turtles of India. In: P.P. van Dijk, B.L. Stuart and A.G.J. Rhodin (eds), *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. In: P.P. van Dijk, B.L. Stuart and A.G.J. Rhodin (eds), *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. Chelonian Research Monographs No. 2, pp. 86–94. Chelonian Research Foundation, Lunenburg, MA, USA.
- [19] Ahmed, M.F. and Das, A. 2010. *Tortoises and Turtles of Northeast India: Saving them from Extinction! Survey, Assessment of Present Status and Conservation of Tortoises and Freshwater Turtles in Northeast India*. Technical Report, Aaranyak, HRCI: 01/2010. Guwahati, India.
- [20] Rashid, S.M.A., and Khan, S.M.M.H. 2000. Trade and Conservation Status of Freshwater Turtles and Tortoises in Bangladesh. In: P.P. van Dijk, B.L. Stuart and A.G.J. Rhodin (eds), *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. Chelonian Research Monographs No. 2, pp. 77-85. Chelonian Research Foundation, Lunenburg, MA, USA.
- [21] Akbar, M., Mushtaq-ul-Hussan, M. and Zaib-u-Nisa. 2006. Distribution of freshwater Turtles in Punjab. Pakistan. *Caspian. J. Env. Sci.* 4(2):142-146.
- [22] Khan, MZ., Safi, A., Fatima, F., Ghalib, SA., Hashmi, MUA., Khan, IS., Siddiqui, S., Zehra, A. and Hussain, B. (2015). An Evaluation of Distribution, Status and Abundance of Freshwater Turtles in Selected areas of Sindh and Khyber Pakhtunkhwa Provinces of Pakistan. *Canadian Journal of Pure and Applied Sciences.* 9(1):3201-3219.
- [23] Noureen, U. (2009). Freshwater Turtles of Pakistan: Illegal trade in Sindh: Preliminary findings of trade in Freshwater Turtle Parts. A survey report submitted to the Ministry of Environment's Pakistan Wetlands Programme. pp 36.
- [24] Ceballos, C. P. and Fitzgerald, L. A. (2004). The trade in native and exotic turtles in Texas. *Wildlife Society Bulletin* 32(3): 881-891.
- [25] Nijman, V., Todd, M. and Shepherd, C. R. (2012). Wildlife trade as an impediment to conservation as exemplified by the trade in reptiles in Southeast Asia. *Biotic Evolution and Environmental Change in Southeast Asia* 82:390.
- [26] IUCN TFTSG and ATTWG (IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and Asian Turtle Trade Working Group). 2000. Recommended changes to 1996 IUCN Red List Status of Asian turtle species. In: P.P. van Dijk, B.L. Stuart and A.G.J. Rhodin (eds), *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. Chelonian Research Monographs, Number 2, pp. 156-164. Chelonian Research Foundation, Lunenburg, MA, USA.
- [27] Chng, S.C.L 2014. Escalating Black Spotted Turtle *Geoclemys hamiltonii* trade in Asia: a study of seizures TRAFFIC, Petaling Jaya, Selangor, Malaysia.
- [28] Praschag, P., Ahmed, M.F. & Singh, S. 2019. *Geoclemys hamiltonii* (errata version published in 2019). The IUCN Red List of Threatened Species 2019: e.T9029A152050337.