A 2003 Encounter with the Taliban in a Combat Zone While Sampling Macroinvertebrates from a Mountain Stream in Shakar Dara, Afghanistan

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Field research performed during combat operations in Afghanistan in 2003 (Combined Joint Special Operations Task Force-Afghanistan).

Abstract

The global distribution of freshwater benthic macroinvertebrates inspired an American soldier, who was deployed to Afghanistan eight months after the September 11 attacks, to undertake a sampling expedition focused on these organisms in the subalpine region of Shakar Dara, Afghanistan. This initiative may represent the first instance of an American attempting to sample benthic macroinvertebrates in Afghanistan. During the expedition, a small sample of the Ephemeroptera-Plecoptera-Trichoptera (EPT) Complex was collected from the Shakar Dara River and preserved. While seining in a riffle, the soldier and his assistant encountered a truck loaded with a dozen heavily armed Taliban insurgents. The pair found themselves vastly outnumbered and outgunned, resulting in a tense standoff. Eventually, the Taliban crossed the river and disappeared over the horizon, bringing the sampling expedition to an abrupt end. The collected EPT samples were sent to a renowned university, where the Regent's Professor of Entomology reviewed them. He believes these samples could be undiscovered *Type specimens* awaiting classification. A review of the ecological literature on benthic macroinvertebrates revealed a significant lack of research from Afghanistan. The high mountains of the Hindu Kush drain into five major basins that contain thousands of seemingly pristine freshwater streams. These streams offer significant opportunities for ecologists, biologists, and entomologists to conduct scientific research. However, with the fall of the Islamic Republic of Afghanistan's government and the Taliban's takeover, scientific academia and research are at risk of being completely eradicated.

Keywords: Stream sampling; Benthic macroinvertebrates; River Continuum; Ephemeroptera-Plecoptera-Trichoptera (EPT) Complex; Afghanistan; Taliban.

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1. Introduction

1.1 Global distribution of freshwater benthic macroinvertebrates

Freshwater benthic macroinvertebrates are found throughout the world, e.g. mayflies (Ephemeroptera) (Barber-James et al. 2008); caddisflies (Tricoptera) (de Moor and Ivanov, 2008, Valdon and Laudee, 2024); and stoneflies (Plecoptera) (Fochetti, 2008). Cosmopolitan in distribution, genera and species of Ephemeroptera, Tricoptera, and Plecoptera (EPT) are found in the Nearctic realm of North America; the Neotropical realm of South America; the Palearctic realm (including Oriental) regions of west, central (where Afghanistan is located), east, and southeast Asia; the Afrotropical realm of Sub-Saharan Africa and the Arabian Peninsula; and the Australasian realm of Australia, Tasmania, and the Pacific Realm.

In the Palearctic realm, much of Afghanistan's landmass is formed by the high mountains of the Hindu Kush whose topography forms catchments from snow and precipitation dropping into five major drainage basins where transboundary conflict for this natural resource with its neighboring country of Iran bounded to the west exists today (Dehgan and Palmer-Maloney, 2011) (Figure 1). Afghanistan society is dependent on the supply of fresh, uncontaminated, clean water runoff into the vast number of mountain streams and rivers that make up the country's watersheds.

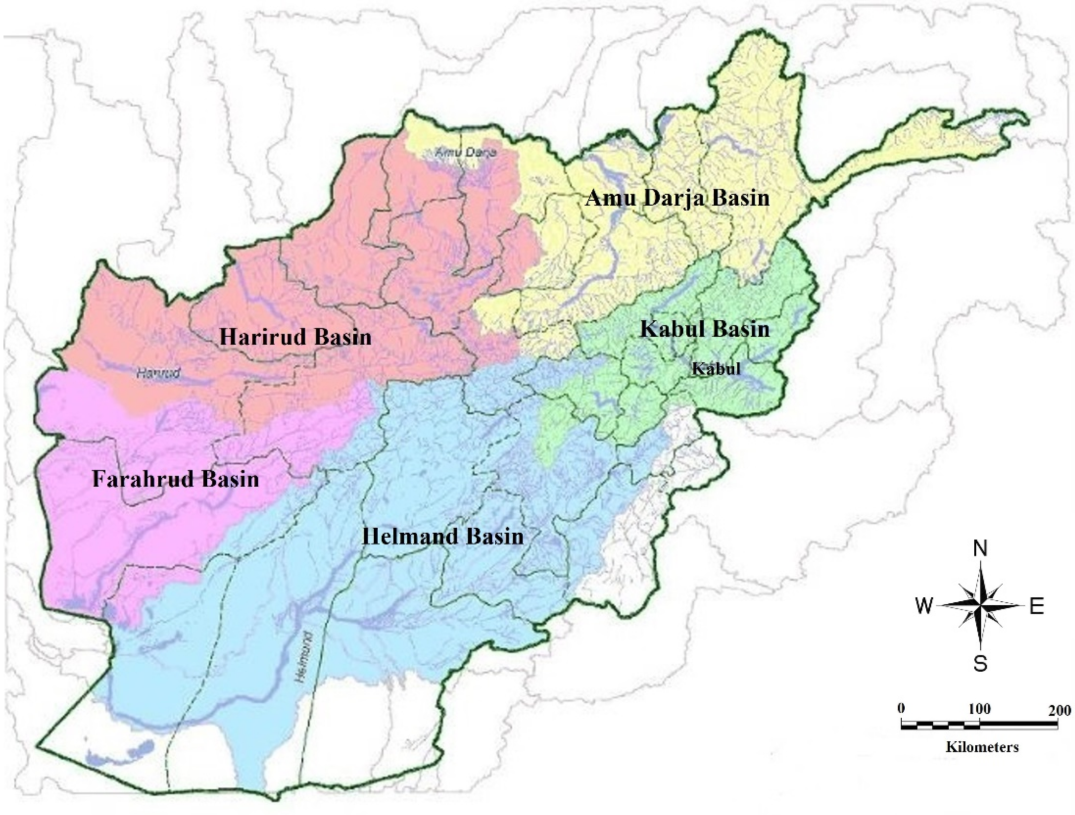


Figure 1. The five river basins of Afghanistan. Source:
Water resources of Afghanistan (Dehgan and Palmer-Maloney, 2011).

Streams, creeks, and river systems (lotic habitats) are dominated by whole orders of benthic macroinvertebrates (e.g. Plecoptera, Ephemeroptera, Odonata, Tricoptera, Megaloptera, etc.). Unlike the zooplankton who dominate lentic and marine waters, freshwater benthic macroinvertebrates have adapted well to the freshwater aquatic environment despite their terrestrial origin through the adaptation of their tracheal gills and waxy cuticles for diffusing dissolved oxygen for respiration and as a primary barrier to water and salt exchange, and flight abilities after molting into adulthood (Rolbiecki, 2024, Resh and Rosenburg, 1984). Benthic macroinvertebrates play a crucial role in freshwater stream ecosystems. Their life stages can last several years in the water with relatively small mobility and limited range (with the exception of biotic and abiotic ques to drift to a different site); they are able to break down coarse particulate organic matter (CPOM) into fine particulate organic matter (FPOM) for specialized filter-feeding macroinvertebrates who break it down further into dissolved organic matter (DOM) for microbial zooplankton and bacteria; in all, forming the bottom-up trophic food web for top-of-the-food-chain feeders. Macroinvertebrates are easy to identify and are good indicators of the health of streams (Salmon Watch, 2015, Gao et al. 2023, Wheatley, 2024). Measures of high stream quality will indicate the existence of freshwater ecosystems having vastly greater habitat diversity hosting a diverse and heterogeneous number of aquatic and terrestrial flora and fauna that makes up the trophic pyramid within the "river continuum" (Vannote et al, 1980, Moi et al., 2024, Rolbiecki, 2025) (Figure 2). Diversity can be measured both qualitatively and quantitatively and has been well documented (Vannote et al, 1980, Resh and Rosenburg, 1984, Zar, 1996, Brower et al., 1997, Spiegelberger et al., 2006, Dehgan and Palmer-Maloney, 2011, Nilsson et al., 2010, Wurzbacher et al. 2016 (see also Appendix 1), Gilbert and Levine 2017, Hoppenreijs et al., 2024, Rolbiecki, 2025). Ranked among the best method of quantifying biodiversity indices is measuring species richness and evenness, which, when combined, are metrics of the ecosystem's health, balance of hydrological cycles, energy input, and the balancing of the trophic pyramid (Rolbiecki, 2025). Trophic relations in freshwater systems may be looked at as being five levels in a trophic pyramid: 1) primary producers (phytoplankton, algae), 2) primary consumers (herbivores), 3) secondary consumers (insectivores, carnivores), 4) tertiary consumers (top carnivores), and 5) detritivores (Resh and Rosenburg, 1984, Rolbiecki, 2025).

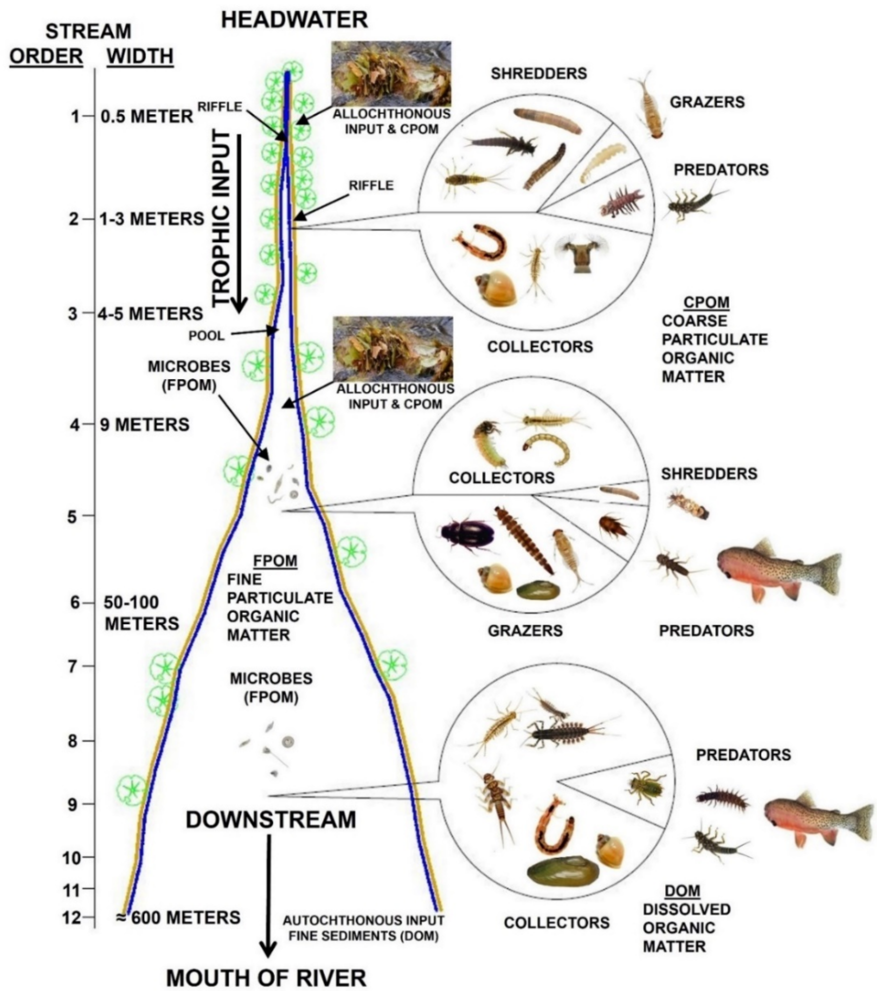


Figure 2. Graphical rendering of Vannote et al. (1980) "The River Continuum" showing functional feeding groups with the changing stream morphology, energy input, and the trophic pyramid (Resh and Rosenburg, 1984, Rolbiecki, 2025).

1.2 Search of literature on freshwater alpine streams and diversity in Afghanistan

Some literature on freshwater stream ecology in Afghanistan was found and is presented in my search for research in Asia and Africa; albeit Afghanistan has essentially been a conflict zone since 1978. Based on what I found—though not all inclusive—much research is devoted to environmental conservation, agriculture, dam suitability (damming up major streams to produce hydroelectricity, residential and commercial water consumption), climate change, drought, biomedicine (plants), and crane research. There is one published paper titled "National Biodiversity Strategy and Action Plan for Afghanistan 2024 - 2030" (NBSAPA, 2023, Wurzbacher, 2016 [in Appendix 1]) which addresses biodiversity at the national level; however, not necessarily technical or scientifically useful for stream ecology research. Chapter 2 provides an overview on biodiversity, major plant and animal species taxa, and global status (stable, instable, vulnerable, critical, endangered). NBSAPA has recognized three major threats to Afghanistan's biodiversity: 1) Loss and degradation of natural ecosystems; 2) Effects of climate change; and 3) Overexploitation of living resources. Upon review of a relative species richness map (Figure 2 in NBSAPA, 2023), it geographically shows species richness appearing to be greatest in the geographic areas of subalpine drainage basins—presumably areas near flowing freshwater.

Another graphic map (Figure 3 in NBSAPA, 2023) shows the areas of critical/endangered, and vulnerable ecoregions, which, when overlaid on the previous map, these critical ecoregions, not surprisingly, line up with the geographic regions of greatest species richness. Thus, when a map of the Afghan population density (Figure 7 in NBSAPA, 2023) is overlaid onto the ecoregion map, the density of people per 0.01 km^2 was greatest in the critical/endangered, and vulnerable ecoregions, indicating cause by anthropogenic affect through overexploitation, depletion of groundwater from damming, and environmental pollution (Spiegelberger, 2006, Wurzbacher, 2016). Figure 3 presents a perfunctory sampling of ecological research literature from Central, South, Southwest, and Southeast Asia, and Africa (for further information related to this topic, please refer to Appendix 1).

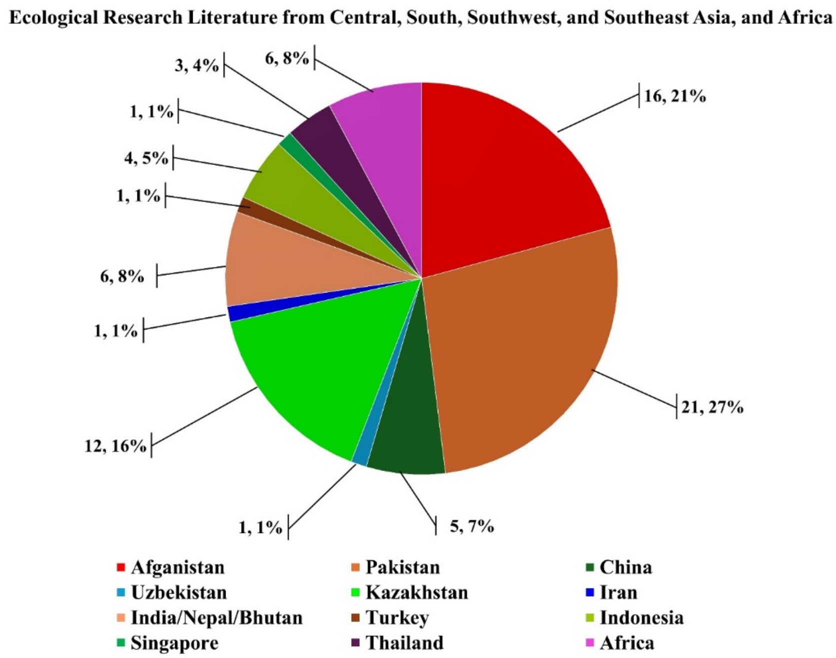


Figure 3. Perfunctory sampling of ecological research literature from Central, South, Southwest, and Southeast Asia, and Africa. Numbers for publications are shown first, followed by percentages. Citations in this study are found in Appendix 1: Afghanistan, Pakistan; China, Uzbekistan, Kazakhstan, Iran, India/Nepal/Bhutan, Turkey, Indonesia, Singapore, Thailand, and Africa.

Although Figure 3 shows Pakistan, Afghanistan, and Kazakhstan dominating the number of publications found amongst the twelve countries sampled, the areas of research were found to be mostly on hydrology, habitat quality, climate change, anthropogenic disturbances and introduction of exotic species. Pakistan showed to have the most research in freshwater and stream fauna (Table 1 and Appendix 1).

Table 1. Subjects of ecological research by country from literature found and shown in Appendix 1 (see Figure 3).

Country	Biodiversity	Terrestrial Invertebrates	Freshwater /Stream Fauna	Terrestrial Fauna	Bird Conservation	Freshwater Algae
Afghanistan	4	0	0	1	2	0
Pakistan	10	3	14	1	1	2
China	1	0	1	0	0	0
Uzbekistan	1	0	1	0	0	0
Kazakhstan	8	2	6	2	1	1
Iran	1	0	0	0	0	0
India/Nepal/ Bhutan	4	0	2	0	0	1
Turkey	1	0	1	0	0	0
Indonesia	4	0	4	0	0	1
Singapore	0	0	1	0	0	0
Thailand	3	0	3	1	0	0
Africa	5	0	2	2	0	1

Table 1 (continued)

Country	Aquatic Plants	Agro-Ecology	Hydrology	Habitat Quality	Climate Change	Disturbances /Exotics	Pollution	Eco-tourism
Afghanistan	1	2	3	2	4	3	2	0
Pakistan	0	0	0	3	0	8	2	0
China	0	0	1	2	1	3	1	1
Uzbekistan	1	1	1	1	1	1	1	0
Kazakhstan	3	3	9	8	3	11	9	0
Iran	0	1	0	0	1	0	0	0
India/Nepal/ Bhutan	0	1	1	4	0	3	3	2
Turkey	1	0	1	1	0	1	0	0
Indonesia	1	0	1	4	2	3	3	1
Singapore	0	0	0	0	0	0	0	0
Thailand	1	0	1	3	0	2	2	0
Africa	3	0	2	3	0	6	5	0

1.3 Macroinvertebrate stream sampling in the war zone of eastern Afghanistan

It is safe to say that everyone who was awake on the morning of September 11, 2001, can remember what they were doing when the planes hit the twin towers. I was conducting a boundary survey in Whiterock Lake, Dallas, Texas, when I noticed my dual-frequency Global Positioning System (GPS) rover receiver was out of position by more than 12.19 cm than the expected accuracy of 2 cm. I performed checks and rechecks on the equipment setup, but to no avail. Then I received a call from my office saying that the World Trade Center was intentionally struck by two large commercial airliners. I instantly knew this was an act of terrorism on United States soil, and that the United States Department of Defense intentionally degraded the GPS signals used in radio navigation. Soon, all private and commercial air traffic was cleared from the skies over the United States. As a U.S. Army

Special Forces soldier in the Army Reserves, I knew I was going to war. Two months later, I received a Presidential Mobilization Order for all reserve-component special operations units to prepare to mobilize for combat operations in Afghanistan. I deployed to Afghanistan the following August of 2002.

On every overseas deployment I went on since finishing my Master of Science degree in aquatic biology, I always took along a freshwater stream sampling kit composed of a seine, kick net, multiple small and medium-sized specimen collecting bottles, specimen labels, and large squeeze bottles of 70% ethanol (EtOH) for preserving aquatic macroinvertebrates and fishes. When I found the time overseas, I would look for a freshwater stream to conduct sampling. Afghanistan was no different.

After the Taliban regime was defeated by the United States on December 9, 2001, the leader, Mullah Omar fled to Kandahar, Afghanistan, and left the Taliban to be governed under tribal law (Katzman and Thomas 2017). Afghanistan was aided by the Coalition countries to form a post-Taliban, democratic central government. The Taliban then operated as an insurgency against the new Afghan central government, and continued to align itself with Al Qaeda, other terrorist groups (Jalaluddin Haqqani (Haqqani) and Hezb-e-Islami Gulbuddin (HIG) networks), and warlords; collectively, they carried out attacks on Coalition forces. The insurgents operated throughout Afghanistan, to include Shakar Dara, Kabul Province, Afghanistan (Figure 4).

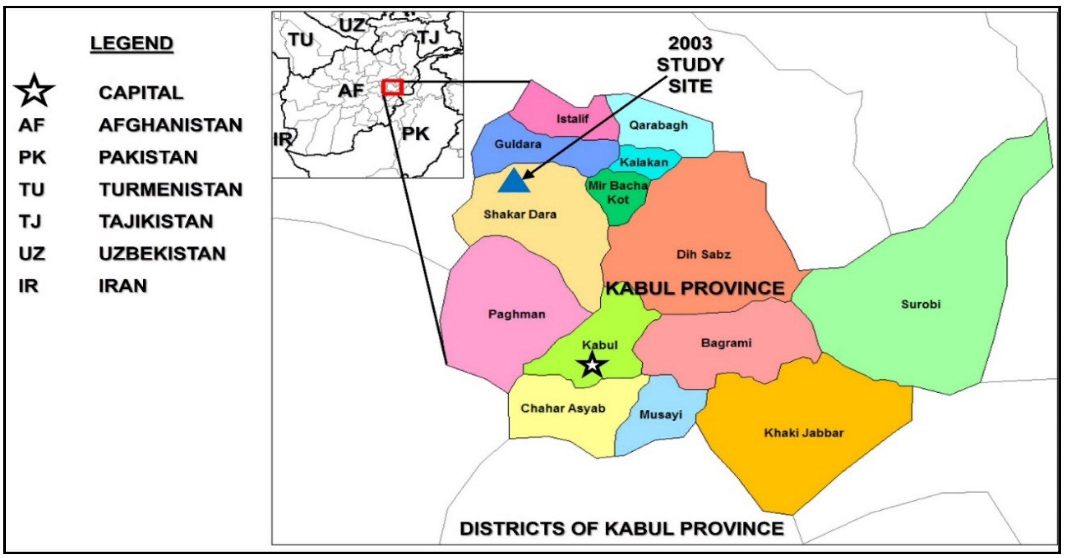


Figure 4. Modified map of the districts in Kabul Province, Afghanistan.
Note location of January 2003 stream macroinvertebrate site in Shakar Dara District.
Source: https://upload.wikimedia.org/wikipedia/commons/thumb/1/1d/Kabul_districts.png/250px-Kabul_districts.png. Accessed December 26, 2024.

During combat operations in Afghanistan, I deployed to Shakar Dara District in November of 2002 to hunt down a key lieutenant of a Taliban network operating in the mountains near the village of Shahar Dara. The area was surrounded by high mountains (ghars) of the Hindu Kush in a drainage basin feeding the Shakar Dara River. The valley was in the subalpine ecosystem with an elevation range between 2,080 – 2,280 m. The largest mountain in the area is Koshkak Ghar of the Band-e Koshkak mountain range with an elevation of 3,400 m (Figure 5).

Figure 5. Koshkak Ghar looking west. The Shakar Dara River is seen to the left of the dirt road. Note the presence of poplar and willow trees lining the river. Source: The author, November 2002.

Enroute to Shakar Dara, I led a convoy of gun trucks with 15 members of my unit, and our translator (Figure 6 and 7). As we made our way to the village, we drove by a field of four Russian T-62 tanks that the Taliban had abandoned, and the Afghanistan Ministry of Defense confiscated. These tanks were left by the Soviet Union when they pulled out of Afghanistan in 1988-1989. A civil war ensued, and the Taliban took control of these tanks and many other armored vehicles, artillery, and machineguns abandoned by the Russians (Figure 8). These battlefield-recovered weapons were used by the Mujahideen and Taliban during the pre-9/11 Afghanistan civil war (1989-2001). When they captured Kabul in September 1996, the Taliban established the Islamic Emirate of Afghanistan; stood up their own military with these former Soviet union weapons. From 1996 to December 2001, the Taliban used Afghanistan to provide a safe haven for Al Qaeda to establish a base of operations and training ground for recruited terrorists (Katzman and Thomas, 2017, National Counterterrorism Center, 2025).

Figure 6. U.S. Special Forces convoy enroute to Shakar Dara, November 2002.
Source: The author, November 2002.

Figure 7. U.S. Special Forces gun truck in Shakar Dara, November 2002. From left to right:
1) Local Afghan boy; 2) "Phil"; 3) The author; 4) "Fries"; 5) "Sid" on the machinegun.
Koshkak Ghar can be seen in the background. Source: The author, November 2002.

Figure 8. Former Soviet Union T-62 tanks used by the Taliban from 1996 to 2001 found outside the village of Shakar Dara. Following the defeat of the Taliban in December 2001, the new Afghanistan central government fervently tried to confiscate these weapons in order to keep them out of the hands of insurgents and warlords. Source: The author, November 2002.

When we arrived in the village of Shakar Dara, we stopped at a local grist mill powered by the Shakar Dara River. We met with a local elder male who ran the grist mill that supplied flour for the village (Figure 9). Outside the grist mill, I walked to the nearby river and noticed the likeness of mountain streams and riparian trees to what I had seen in the subalpine regions in the states of Colorado, Wyoming, and Montana, United States. The Shakar Dara River was crystal clear and cold, with many pools and riffles. I waded into the river and examined the gavel and rocky substrate (Figure 10) and surmised that this river would contain benthic macroinvertebrates living in a healthy stream—namely, Plecoptera, Ephemeroptera, and Tricoptera. Having found three suitable sites in the Shakar Dara River that could potentially host benthic macroinvertebrates, I made a promise to myself to return to this river after this mission and bring my stream sampling equipment and find out.

1.4 Purpose

The aim of this case study is to share a rare occasion where an American soldier found a freshwater mountain stream and made the presumption that the Shakar Dara River would yield sensitive freshwater macroinvertebrates if given the chance to return to conduct a net sampling in the river. I returned to the Shakar Dara River on January 21, 2003, and found the three suitable sampling spots in the river. Freshwater macroinvertebrates were found and preserved, but not enough to quantify or test a hypothesis of species diversity, richness, or evenness. Due to an encounter with the Taliban on that trip in January 2003, the sampling expedition was cut short.

Figure 9. Inside the grist mill powered by the Shakar Dara River. From left to right: 1) Our translator; 2) "Sid" (kneeling); 3) Afghan elder (standing) who operates the mill. Source: The author, November 2002.

Figure 10. The author examining the stream substrate of the Shakar Dara River near the local grist mill. Source: The author, November 2002.

1. Materials and Methods

2.1 Location

On January 21, 2003, I left my forward operating base enroute to Shakar Dara to the stream sampling sites I picked out the previous year in November of 2002. Accompanying me was "Brian" from my unit, two United Kingdom (UK) Army Explosives Ordinance Disposal (EOD) officers, and their driver, "Phil" (Figure 11).

Figure 11. Party accompanying author enroute to the stream sampling site on the Shakar Dara River. From left to right: 1) "Brian"; 2) "Phil"; 3) the author; 4) UK EOD officer 1. Taking the picture was UK EOD officer 2. View seen looking northeast. Source: The author, January 21, 2003.

The sampling area is located on the Shakar Dara River, village of Shakar Dara, Shakar Dara District, Kabul Province, Afghanistan, in the Band-e Koshkak mountain range with developed alluvial forms, of the Hindu Kush: Latitude 34°41'18.2" N, Longitude 069°01'20.5" E; elevation 2,078 m above sea level (Figure 12 and Figure 13)). The aforementioned grist mill is located about 200 m to the east of the study site.

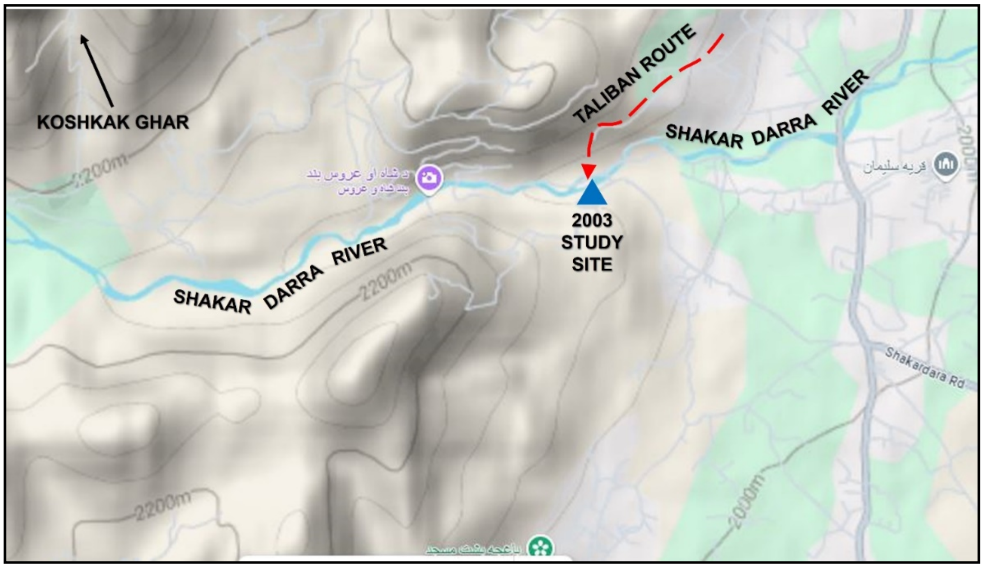


Figure 12. Location of stream sampling area on the Shakar Dara River, Afghanistan. The sampling site is located in a saddle between two mountains (ghars). Koshkak Ghar is located in the northwest corner of this figure. Red-dashed arrow shows possible route the Taliban took to ford the river.
Source: Google Maps, December 26, 2024.

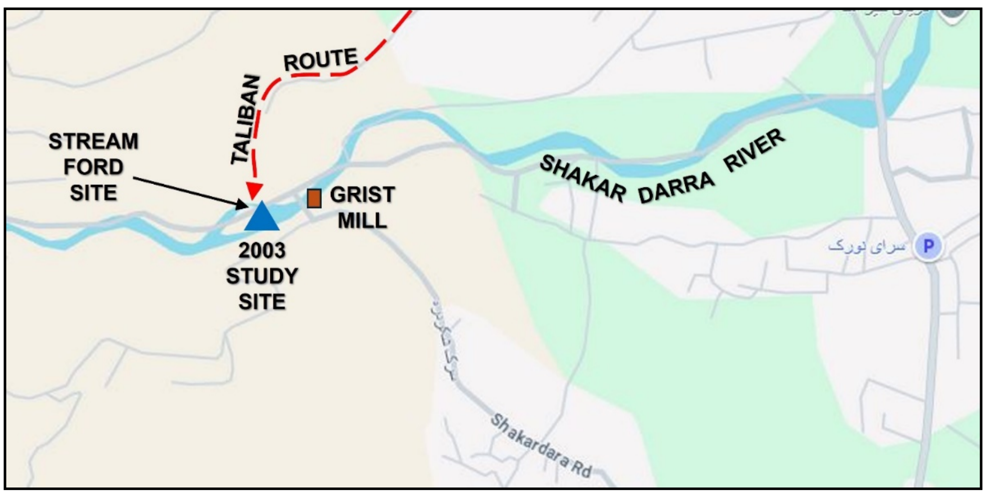


Figure 13. Zoom-in view of the stream sampling site on the Shakar Dara River, Afghanistan. The site is located about 200 m west of the grist mill in Shakar Dara village. Red-dashed arrow shows possible route the Taliban took to ford the river. Source: Google Maps, December 26, 2024.

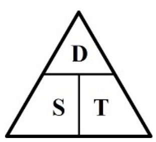
The sampling area consisted of three sites I considered suitable to find benthic macroinvertebrates: 1) a riffle site to find grazers, shredders, collectors, and predators specially adapted to clinging to the bottom of cobble in the fast-flowing stream substrate; 2) a pool site to find the aforementioned macroinvertebrates adapted to this environment; and 3) a site where the river opened up to find collectors and predators adapted to this environment. The three sampling sites were located in the semi-treeless alpine meadows of the Band-e Koshkak mountain range, and about 1,000 m upstream of the typical riparian zone found at the subalpine/montane interface, which was dominated by poplar trees and other willows (Figure 5).

2.2 Sampling protocol

Assisting me was “Phil” from the UK EOD group accompanying me on this day. “Brian” and the two UK EOD officers dropped “Phil” and I off at the sampling sites. I made a tactical decision to leave our long guns (I kept my 9 mm Baretta semiautomatic pistol concealed on my person) with "Brian," who said he was taking the two UK EOD officers down to the grist mill, which was a few hundred meters downstream.

Sampling protocol generally followed the methods in Chapter 3e, Field and Laboratory Methods for General Ecology, prescribed by Brower, Zar, and von Ende (1997). Riffle sampling was done using a 1-by-6-meter bag seine (1 cm mesh) at three replicate sample locations in close proximity. Seine pulls were difficult due to the swift current, which resulted in only $\approx$5 m upstream pulls with a partially opened seine ($\approx$4 m). Pool sampling was done using a 500 μm Tri Net (0.3 m triangular opening) with a 1-meter-long wood handle and pushed along the bottom for $\approx$5 m while kicking up the substrate in front of it. Riffle and pool samples consisted of three replicate samples in close proximity. Contents of each replicate sample were hauled to the shore and sorted in a white porcelain pan to separate the macroinvertebrates using stainless steel tweezers from water, sediment, litter, and vegetation, and placed in labeled 50 ml bottles and preserved with 70% EtOH. Temperature and dissolved oxygen were not taken because I did not have the YSI Model 10 temperature-dissolved oxygen meter normally used in previous stream sampling trips with me on this combat deployment, which limited how much personal gear I could bring. Depth was measured by noting where the level the water was from the top of my boots and later extrapolated into meters. River current was measured by timing a small piece of paper released on the water surface, observing it flow the length of a paced-off transect on the riverbank, and dividing transect distance by the elapsed time according to Equations 1-3:

Distance-Speed-Time



$$S = D \div T \tag{1}$$

$$D = S \times T \tag{2}$$

$$T = D \div S \tag{3}$$

3. Results

3.1 Stream morphology and hydraulics

The stream width at the sampling sites was approximately 2 m at the riffle area and 5 m at the pool and open area. Stream substrate consisted of coarse sand and rocks, and large cobble ranging from 7-20 cm (eyeball estimate). Examination of the bottom of large cobble showed the existence of slick algal cover and similar epiphytes. The water was crystal clear, very cold, and presumed to have increased amounts of dissolved oxygen. The river velocity was fast, and based on a visual assessment, the stream gradient looked to be about 2.5-5%. These were indicative of the required abiotic factors, along with river morphology required for suitable headwater habitat and hyporheic ecological interface for sensitive benthic macroinvertebrates (Tornwall et al., 2015; Doretto et al., 2020; Di Cico et al., 2024). Stream depth in pool and open river ranged from 0.3-0.7 m. Riffle velocity was 2.8 $m \cdot s^{-1}$, pool and open river velocity was 1.8 and 1.6 $m \cdot s^{-1}$, respectively.

3.2 Stream fauna collected

We collected various macroinvertebrate taxa in their larval stage along with some unidentified Coleoptera, snails, and other mollusks in only the pool and riffle sites. We did not catch any fishes—bony or otherwise. We found a heterogeneous presence of the EPT Complex (Potikha, 2015, Ceneviva-Bastosa et al., 2017, Schmitt et al., 2019) present in the riffle and pool sites, in what appeared to be morphological and physiological adaptations to the river's substrate. EPT taxa were found in the following functional feeding groups (FFG): 1) Collector-gatherers; 2) collector-filterers; 3) scrapers; and 4) possible predators (Bagatini et al., 2012, Ceneviva-Bastosa et al., 2017, Schmitt et al., 2019). In the riffle site, we managed to find Ephemeroptera, Plecoptera, and Trichoptera nymphs hanging on to the cobble. The bodies of Ephemeroptera and Plecoptera took on a 'flattened' shape, which reduces their profile and allows fast-moving water to flow over them without displacing them. They also exhibited 'gills,' which absorb dissolved oxygen and to control the amount of water flow through the body. Their FFG is presumed to be collector-filterers and scrapers. In the pool site, EPT were often found on the bottom of larger cobble stones where slick algae and similar epiphytes lived. These larvae had larger gills than EPT found in the riffle site. Their FFG is most likely scrapers, collector-gatherers, and possibly predators. Trichoptera were easy to identify with their protective 'cocoon' made with silk encasing grains of sand, twigs, and debris. Counting and enumerating was not done at the sites due to time constraints. All EPT and other benthos were placed in three 50 ml sampling bottles; two from the riffle site, and one from the pool site (Figure 14). Many Ephemeroptera and Plecoptera nymphs were very small, ca. 2-4 mm long. Sampling EPT was suddenly cut short due to an unexpected event.

Figure 14. One of three bottles of macroinvertebrate sampled by the author. The other two sample bottles were mailed directly from Afghanistan to Dr. James Kennedy, Regents Professor, Department of Biological Sciences, University of North Texas, Denton, Texas (United States), for identification. Note: The plastic bottle shown is the original sampling bottle on January 21, 2003. Over the years, the EtOH began to dissolve the cap, so these specimens were recently transferred to the glass bottle shown. The sample labels were mistakenly labeled "Parwan Province." Shakar Dara is located in Kabul Province, Afghanistan. Source: The author.

3.3 Unexpected encounter with the Taliban

During our sample collecting at the riffle site, our attention was strictly focused on picking the benthos out of the porcelain pan and placing them into the sampling bottles. We were totally unaware of our surroundings, when suddenly, we looked up and saw a large flatbed truck with wood side rails full of armed Taliban that had stopped short of fording the north bank of the Shakar Dara River. I estimated about 10-12 Taliban, all carrying arms and wearing bandoliers with rounds of ammunition. What stood out to me was a 7.62×54 mm Russian Pulemyot Kalashnikova machinegun (PKM) with bipod resting on the roof of the cab of the truck. At least two of the Taliban were carrying Russian Ruchnoy Protivotankovy Granatomyot-7 (RPG-7) shoulder-fired rocket-propelled grenade launchers loaded with their warheads. The rest of the Taliban were carrying Russian 7.62×39 mm Avtomat Kalashnikova-47 (AK-47) automatic rifles (Figure 15).

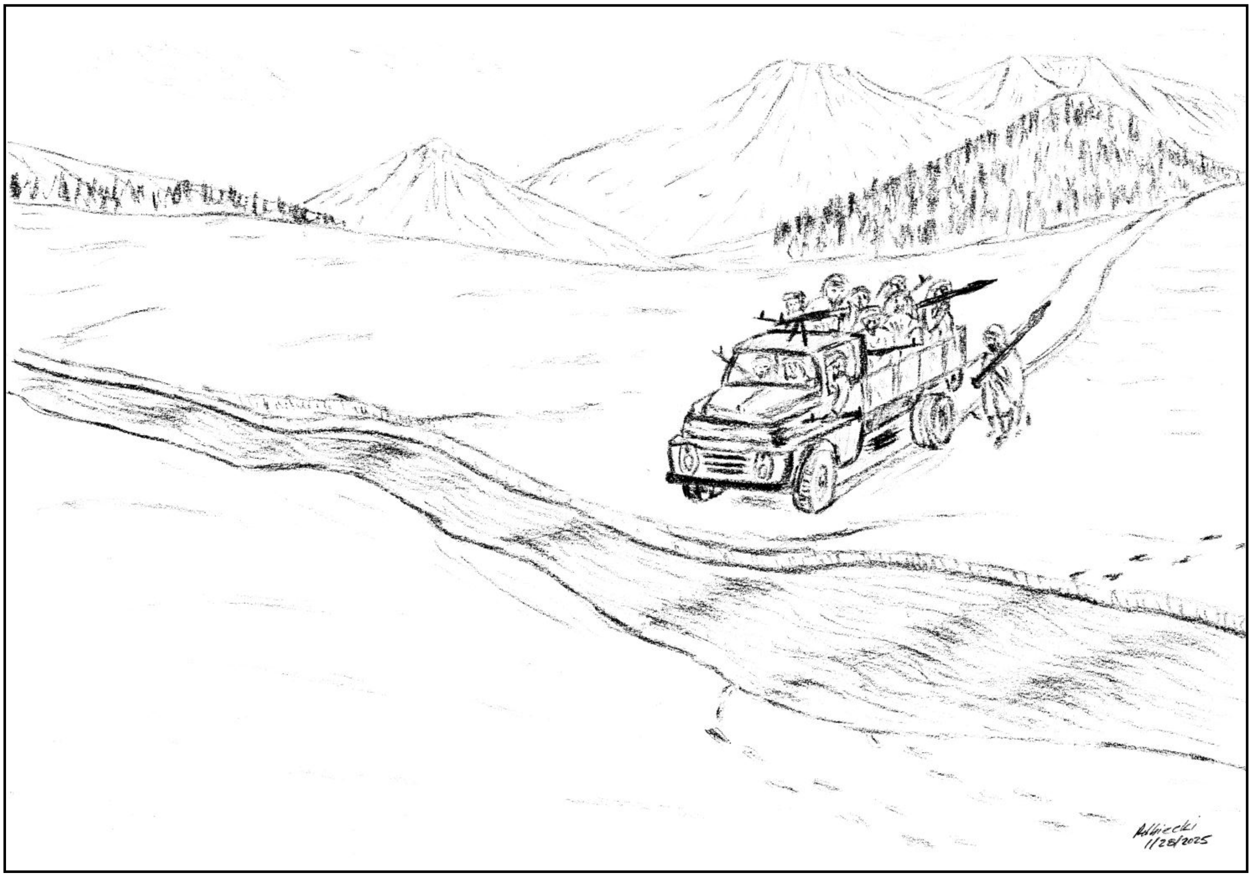


Figure 15. Author's drawing of the encounter with the Taliban. The truck was carrying 10-12 armed Taliban insurgents. Koshkak Ghar is seen in the far background, looking northwest. Our footprints appear in the snow in the foreground. Drawing was done from memory; no photographs were taken for obvious reasons. Source: The author, January 28, 2025.

This encounter can only be described as surreal and bizarre, because here were two "military-age" Caucasian males the Taliban presumed to be 'playing around' in a river for no reason. "Phil" and I froze still holding the seine and looked back at them. The Taliban just stared intently at us and did not make any movement either. This so-called stand-off lasted for about one minute. Based on my observation, the Taliban seemed confused by what they encountered, and they appeared angry that we were blocking their ford site. (I speculated at that time they probably thought "Phil" and I were a non-governmental organization (NGO) water-works party and not "Americans of the Coalition forces"). My surreality got the best of me, and the first thing that popped into my head was the scene out of the movie "Animal House," when the Delta Tau Chi fraternity boys walked into the Dexter Lake Club to see Otis Day and the Knights perform, and all of the patrons—including Otis Day—suddenly stopped and silently stared back at the Delta boys ("Wait til Otis sees us", 2012). That scene was eternally etched in my mind as I looked back at the Taliban staring us down.

During this stare down with the Taliban, "Phil" was certainly upset and demanded to know what I was going to do about this, because in his mind, he told me "You've gotten us killed—what do you propose we do?" I replied, "Nothing, just keep seining, they would have already lit us up by now." On my queue, we continued our collecting and turned our backs to the truck as if we felt their presence was not an issue. Slowly, the Taliban mounted their truck and forded the river. As we looked back, the Taliban had their weapons trained on us as they drove away and over the horizon. Once the Taliban were gone, "Phil" dropped his end of the seine and hastily crossed the river and bolted up the hill towards our comrades whom we thought were at the grist mill, leaving me to pick up all of the sampling equipment. This just ended my stream macroinvertebrate sampling in Afghanistan.

On my return to our vehicle, "Phil" was visibly and verbally upset about what just happened and expressed his anger towards me to the point where "Phil-the-Private" was becoming insubordinate to me, a commissioned army officer, so I reminded him of that. We conducted a quick after-action review of what just happened, and we sans "Phil" determined that the Taliban never saw our vehicle, "Brian", and the two UK EOD officers, because they were parked ca. 100 m south of the gristmill and were hidden below the backside of a ridge east of the location of the Taliban's route. We finally concluded: If the Taliban had seen our entire party, they would likely have opened fire on us.

3.4 Epilogue to the encounter with the Taliban

About a year after my redeployment back to the United States, I received an email from a lawyer representing "Phil" who asked me to be a character witness in a lawsuit "Phil" filed against the UK Army for suffering Post Traumatic Stress Syndrome (PTSD), claiming he was forced to go out on these Special Operations." I politely declined. Nothing was ever heard from "Phil" since that email.

In retrospect, I made a bad decision which could have gotten all of us killed. On the other hand, I believe that our response towards the Taliban at the ford site on the Shakar Dara River on January 21, 2003, was the right response, because we posed no threat to them. If I could only know what the Taliban were thinking when they rolled up on us that day.

4. Discussion

Having actually found EPT in the Shakar Dara River in the Band-e Koshkak mountain range of the Hindu Kush, I have every reason to believe many of the thousands of headwater streams in Afghanistan are pristine and have a high level of habitat diversity with a diverse and heterogeneous number of aquatic insects making up the trophic pyramid within the river continuum (Vannote et al., 1980, Moi et al. 2024, Rolbiecki, 2025). The sample bottles I mailed to Dr. James Kennedy, Regents Professor, Department of Biological Sciences, University of North Texas, Denton, Texas (United States) were enumerated and analyzed, whereby Dr. Kennedy responded to me by saying there could be unnamed *Type specimens* of the EPT Complex that are waiting to be discovered. This makes sense in that Afghanistan has been a war zone for so long, and during the Taliban rule from the Afghanistan civil war until 2001, the Taliban dispensed with higher education and research; and since they have retaken control of Afghanistan on August 15, 2021, universities have been shut down, and science education is virtually nonexistent. Many scientists in Afghanistan are either fleeing the country, or fear Taliban retaliation (Boerkamp, 2021, Boroujerdi, 2023). This seemingly tyrannical approach of governance is likely to remain indefinitely until at some point in time, the Taliban embraces science and education (Raz, 2024).

In 2010, I returned to Afghanistan on combat deployment to the Korangal Valley, Kunar Province. The Taliban were responsible for illegal tree cutting to fund their opium business from harvesting the breadseed poppy, *Papaver somniferum*. From their indiscriminate tree cutting, there was no regard for erosion control measures, which polluted sensitive mountain streams with sediment loading.

In the National Biodiversity Strategy and Action Plan for Afghanistan 2024 – 2030 (National Environmental Protection Agency, Islamic Republic of Afghanistan, 2024), it suggests there has been so little research in species diversity and considers Afghanistan a "global biodiversity hotspot"—placing Afghanistan in the Critical Ecosystem Partnership Fund's "Mountains of Central Asia Biodiversity Hotspot" (Critical Ecosystem Partnership Fund, 2017), which includes Uzbekistan, Tajikistan, Kazakhstan, and Kyrgyzstan, and suggests a tiny proportion of invertebrates have been assessed. The National Biodiversity Strategy and Action Plan for Afghanistan 2024 – 2030 has identified three major threats to Afghanistan Biodiversity: 1) Loss and degradation of natural ecosystems; 2) Effects of climate change; and 3) Overexploitation of living resources. Additionally, this strategy and action plan identifies Afghanistan's greatest human footprint is across the northern provinces, most especially in the large urban areas of the Kabul-Jalalabad corridor, which Shakar Dara lies within. How the current government, the Islamic Emirate of Afghanistan (IEA) addressed their National Biodiversity Strategy and Action Plan for Afghanistan 2024 – 2030 at the 16th Conference of Parties at the 2024 United Nations Biodiversity Conference, is yet to be determined because it ended without a quorum (Wildlife Conservation Society, 2024).

With Afghanistan's exploitation of natural resource and its dependency on the supply of fresh, uncontaminated, clean water, the Shah wa Arus Dam was built on the Shakar Dara River after my 2002-2003 combat deployment, ca. 400 m west of the study site to supply irrigation water to 3,500 ha of land, 5 million m^3 of drinking water for Kabul, and up to 1.2 megawatts of electricity (TOLOnews, 2024). Construction of the dam began in 2011 and completed in 2024, when the Ministry of Energy of the IEA celebrated the construction completion with an inauguration ceremony on December 31, 2024. A time comparison relative to the 2003 study site of the Shah wa Arus Dam construction progress in 2016 to its current completed state are presented in Figure 16 and Figure 17.

Figure 16. Shah wa Arus Dam construction progress in 2016. Source: The author, January 28, 2025, made with Trimble Business Center Advanced Survey post processing software (Trimble, Inc., Westminster, Colorado, United States).

Figure 17. Completed Shah wa Arus Dam Reservoir. Source: The author, January 28, 2025, made with Trimble Business Center Advanced Survey post processing software (Trimble, Inc., Westminster, Colorado, United States).

5. Conclusion

In this case study, Global distribution of freshwater benthic macroinvertebrates was discussed. In the Palearctic realm, the five major drainage basins of the Hinu Kush in Afghanistan showed the critical freshwater lotic habitats in the montane, subalpine, and alpine ecoregions that supports the Ephemeroptera-Plecoptera-Trichoptera (EPT) Complex associated with highly sensitive and diverse stream habitats. The River Continuum Concept was discussed as it relates to the freshwater stream ecosystem's biodiversity, health, balance of hydrological cycles, energy input, and the balancing of the trophic pyramid.

A review of ecological research literature on alpine streams and diversity from Central, South, Southeast Asia, and Africa was presented. Among the twelve countries reviewed, the areas of research were found to be mostly on hydrology, habitat quality, climate change, anthropogenic disturbances and introduction of exotic species. Pakistan showed to have the most research in freshwater and stream fauna. Afghanistan is lacking in published research of freshwater benthic macroinvertebrates.

The author gave a personal account of benthic macroinvertebrate sampling on the Shakar Dara River, Shakar Dara District, Kabul Province, Afghanistan a year after the Taliban were defeated in December 2001. Specimens of the EPT Complex were found in a riffle and open pool sites on January 21, 2003. The sampling trip on the Shakar Dara River was cut short when a dozen heavily armed Taliban insurgents appeared out of nowhere, endangering the life of the author and his assistant. Unfortunately, not enough sampling sites were used, and the small numbers of EPT could not be used in a quantifiable diversity hypothesis. Two 50 ml bottles containing preserved EPT were mailed from Afghanistan to the University of North Texas (Denton, Texas, United States) Department of Biological Sciences, and upon examination by a renowned Regent's Professor of Entomology, it is likely those unnamed specimens could turn out to be *Type specimens* that are waiting to be discovered. Readers of this case study are encouraged to study these specimens (refer to the Data Availability Statement below), as well as contribute more research to Afghanistan's freshwater ecosystems and benthic macroinvertebrates.

When Afghanistan was turned over to the Taliban in 2021, many scientists in Afghanistan were fleeing the country for fear Taliban retaliation. Scientific education and research in present-day Afghanistan appears to be plight, leaving the so-called National Biodiversity Strategy and Action Plan for Afghanistan 2024 – 2030 in question. Although this plan has been published and endorsed by the United Nations Environmental Programme, and the IEA recognizes the values and benefits of biodiversity to its people (NBSAPA, 2023), more efforts need to be made to conserve Afghanistan's biodiversity. The Federally Administered Tribal Areas (FATA) of Pakistan has been a tacit supporter of the Taliban. Now that the IEA has been in place since 2021 and they seek international recognition, one way of a good faith effort would be for the IEA to fully embrace the NBSAPA and allow research in Afghanistan's biodiversity—in particular—the freshwater sciences, in efforts to preserve the integrity of the sources of freshwater for residential and commercial water consumption. This is now a good time for the IEA to enter into partnership with the Islamic Republic of Pakistan in the research of freshwater streams rich in macroinvertebrate and ichthyofauna in both countries in efforts to suppress illegal anthropogenic activities such as hunting fish with electrical currents, chemicals, explosives, and industrial commercial fishing methods (Akhtar et al., 2015 in Appendix 1 (Pakistan)).

Supplementary Materials

See Data Availability Statement.

Author Contributions

David A. Rolbiecki is the sole author. The author read and approved the final manuscript.

Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript. Readers interested in acquiring collected macroinvertebrate specimens may contact the author at david.a.rolbiecki.mil@cfmo.mil.texas.gov, or Dr. James Kennedy, Regent's Professor, Department of Biological Sciences, University of North Texas, 1155 Union Circle #305220 Denton, Texas 76203-5017, Email: kennedy@unt.edu. The requestor is responsible for arranging the shipping of the specimens and the shipping cost.

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This paper is dedicated to Dr. James Kennedy, Regents Professor, Department of Biological Sciences, University of North Texas. Dr. Kennedy is the quintessential entomologist working in Texas and drives his pickup truck with a butterfly net placed on a gun rack in the rear window, something that made quite an impression on me in a gun culture state.

Conflicts of Interest

The author declares no conflict of interest.

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Appendices

Appendix 1. Country references from literature review to support Table 1 and Figure 3.

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