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### [1] Shad of the Shatt Al-Arab River in Iraq

*A brief review of the biology of shad that spawn in the Shatt Al-Arab River in southeastern Iraq*

by Laith A.J. Al-Hassan

#### Introduction

The Indian shad, *Tenulosa ilisha*, is an anadromous clupeid and its fisheries are important throughout its range. The species is widely distributed, and can be found in the Arabian Gulf, Pakistan, India, Burma and as far east as Cochin China, South Vietnam.

Around the Arabian Gulf, *T. ilisha* is known as "sbour," and it is found along the Iranian side of the Gulf and in the Shatt Al-Arab River. Sbour ascend the Shatt Al-Arab River and migrate upstream to spawn in the marsh area just north of Basrah city. Some have observed sbour further upstream. In 1955, sbour were seen in the river Tigris at Baghdad. At present, the upstream limit of its distribution appears to be the Al-Hammar marsh, 180 kilometers north of Basrah city and 45 kilometers south of Nasiria city.

#### Three Possible Ecotypes

Dutt (1966) identified three possible ecotypes of *T. ilisha*:

1. Fluvial anadromous shad that feed and grow in coastal waters and spawn in middle or lower reaches of rivers above the level of tidal influence.
2. Fluvial potamodromous shad (physiologically but not geographically landlocked stocks) that inhabit the middle reaches of rivers.
3. Marine shad as observed off Veraval city on India's Saurashtra coast.

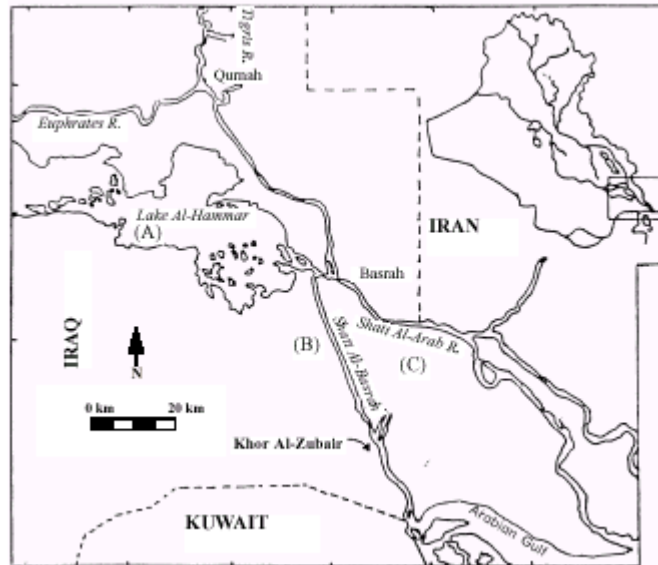


Figure 1. Shatt Al-Arab River, home to sbour, is formed by the confluence of the Tigris and Euphrates rivers. ([View as PDF](#))

## Shatt Al-Arab River

The Shatt Al-Arab River ("Stream of the Arabs") is formed by the confluence of the Tigris and Euphrates rivers at Qarmat 'Ali, 160 kilometers north of the Arabian Gulf ([Figure 1](#)). This river flows southeastward and passes the Iraqi port of Basrah and the Iranian port of Abadan before flowing into the Arabian Gulf. The depth of the river ranges between 8-15 meters. The difference in water level between low and high tide is 1.5 meters during the summer and 0.25 meters during the flood season (April and May).

The average annual runoff of the Shatt Al-Arab River is around 1,750 cubic meters per second. Flow increases during the spring and summer season, reaching its maximum in April and May. In fall, flow decreases and is minimal during October. The yearly flow peak is driven by spring and summer ice melts in the northern reaches of Iraq. The Shatt Al-Arab River is under the continuous effect of floods from the Tigris, Euphrates, Karun and Kargah rivers. Two great floods occurred in 1969 and 1988.

Over the year, there is a large variation in the water temperature of the Shatt Al-Arab River. Water warms rapidly in March, reaches its highest temperature near 32 degrees Celsius in July, then cools to about 16 degrees Celsius in December.

## Biological Aspects of Sbour

Unlike any other commercial fish species, the biology of sbour in Iraq has not been thoroughly investigated (Hussain et al. 1991). However, in the other parts of its range (around the Indian subcontinent, for example) the biology and the ecology of this species has been well studied.

Usually in the first days of March, sbour ascend Shatt Al-Arab River to about 150-200 kilometers north of the city of Amara on the Tigris River. At the beginning of the migration, males are more numerous than females, but as the breeding season approaches, females become more numerous than males. Local fishermen believe that males and females migrate upstream in separate groups, supporting Pilay's (1958) observations. Male and female fish move at different depths, but only in the top meter of the water column.

The fishing season starts in early March, sometimes continuing through the end of August. Large specimens are not available until the summer months. From April to June, the majority measure about 370 millimeters long, while in November and December they are about 135 millimeters long. Sbour feed mainly on diatoms, green and blue-green algae and, to a lesser extent, on zooplankton.

While in the Shatt Al-Arab River, sbour pass through different stages of maturity. There appear to be two peaks in the gonosomatic index (a measure of maturity), March-May and July-August, indicating that sbour spawn more than once during the year. Absolute fecundity of sbour in the Shatt Al-Arab River ranges from about 100,000 to 2,000,000 eggs per female.

Scales cannot be used to determine age of sbour because there are multiple growth or spawning marks found on their surface. Instead, otoliths are used to determine age. In the Shatt Al-Arab River, the maximum age of sbour is 4 years. Older fish are rare during the first months of the spawning run, but comprise most of the run during the summer time (Hussain et al., 1991).

The total landings of sbour in Shatt Al-Arab River is unknown, but landing estimates from the Food and Agriculture Organization area (Shatt Al-Arab River estuary) showed 6,576 tons in the Basrah fish market during 1990-1991.

Which of Dutt's ecotypes best describes sbour? Sbour are not found year-round in the Shatt Al-Arab River; thus Dutt's second ecotype does not apply here. The marine stock ecotype can be also be rejected since there is no evidence of spawning in marine waters. Therefore, only the first of Dutt's ecotypes, the fluvial anadromous ecotype, applies. Sbour, however, do not spawn in the river itself as in Dutt's first ecotype, but in a marsh area to the north.

The timing of the sbour's run into Shatt Al-Arab River, estimated by catches, varies from year to year, probably depending upon many factors. The increase in flow during spring and summer appears to signal the spawning migration of sbour. Increases in water temperature in the spring time may also trigger their migration. *T. ilisha* behave similarly in other regions. In the Hooghly River, upriver migration of *T. ilisha* appears to be governed by sudden increases in water temperature. Temperature increases produce phytoplankton blooms that attract more fish to the river. Such phytoplankton blooms have been observed and these may directly affect the concentration of sbour.

The various physical and biological data may reveal the sbour's movements over the year. Gonad maturation data suggest that sbour spawn in the upper reaches of Shatt Al-Arab ( probably in the marsh area ) during May-August and then migrate to the sea during September-November, when they were landed in Kuwait. The absence of sbour during December-January may be due to their movement toward the Iranian coast of the Gulf near Bushire. In December and January, the water off the Iranian coast of the Gulf and near the estuaries was warmer than that of the Shatt Al-Arab River and Kuwaiti Bay. This warmer water may attract fish toward the Iranian coast during the winter months, away from the upper reaches of the Gulf and the Shatt Al-Arab River. During summer, when water is moderately warm, the inflow current from strait of Hormuz along the Iranian coast of the Gulf reaches north, enabling schools to invade the upper reaches of the Arabian Gulf and Shatt Al-Arab River. During winter, when water is relatively cold, the inflow current reaches further south, preventing sbour from moving northward.

Some have speculated that there are two races of sbour in Iraqi waters—fresh and marine. The native people of Basrah can distinguish by taste sbour caught in the estuary and those caught in the Shatt Al-Arab River. It is well known in Basrah that sbour of Shatt Al-Arab River are tastier and yield a higher price than sbour from the sea. This taste difference may suggest the presence of two separate races in the area. To check this contention, morphological and biochemical studies should be conducted. Biochemical studies are more reliable than morphological studies because the latter can be affected by environmental rather than genetic factors. In biochemical studies, the genetic makeup of the stock can be reviewed and stocks can be discriminated. ■

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## **[2] The Valley Forge Fish Story**

*Scrutiny of primary source material reveals that, contrary to popularized accounts, the Shad run on the Schuylkill River in the U.S.A. may have been blocked by the British during the American Revolutionary War, preventing shad fishing by Washington's troops at Valley Forge*

by Joseph Lee Boyle

### **Introduction**

In 1938 Harry Emerson Wildes published the book *Valley Forge* in which he told a fish story that has endured for more than 60 years. According to Wildes, during the spring of 1778, the Continental Army, led by George Washington and camped at Valley Forge along the Schuylkill River in Pennsylvania, was in dire straits for food:

"Then, dramatically, the famine completely ended. Countless thousands of fat shad, swimming up the Schuylkill to spawn, filled the river....Soldiers thronged the river bank....the cavalry was ordered into the river bed....the horsemen rode upstream, noisily shouting and beating the water, driving the shad before them into nets spread across the Schuylkill....So thick were the shad that, when the fish were cornered in the nets, a pole could not be thrust into the water without striking fish....The netting was continued day after day...until the army was thoroughly stuffed with fish and in addition hundreds of barrels of shad were salted down for future use."<sup>1</sup>

Since 1938 this story has been published with variations in *The Schuylkill* by J. Bennett Nolan (1951), *Valley Forge* by Donald Barr Chidsey (1959), *Birthplace of An Army: A Study of the Valley Forge Encampment* by John B. B. Trussell, Jr. (1977), the *Pennsylvania Angler* (1987), and mostly recently in 1992 in John W. Jackson's

*Valley Forge: A Pinnacle of Courage*. Wildes did not document his source, however, and no known primary source material substantiates the story.

## Early Fishing On the Schuylkill River

From the earliest days of settlement in Pennsylvania, fishing weirs were a source of conflict between fishermen and boatmen. Shad fishing on the Delaware and Schuylkill (a tributary of the Delaware River) generally began around the middle of March, although the anecdotal records indicate a good bit of variance. Fishing in the eighteenth century was usually reported as excellent. Seven shad were once caught with a single scoop of a dipnet. A fishery at Long Ford, at the mouth of the Pickering Creek, caught 8,500 shad in a single day.<sup>2</sup>

Beginning in 1683, laws were enacted to prohibit the erection of fishing dams and weirs on Pennsylvania's navigable waters. This was done in part to keep the rivers navigable, and in part to prevent depletion of the fish. In 1734, the Governor's Council passed "An act to prevent the erecting of wears, dams, &c. within the river Schuylkill." Fishermen attempted to secure the repeal of these measures, or at least change them so that temporary fisheries could effectively operate.<sup>3</sup>

In 1761, the Pennsylvania Assembly declared that the Schuylkill was "navigable for rafts, boats and other small craft in time of freshes only." Commissioners were appointed to collect subscriptions to improve the channel. In their report they recommended removal of fishing dams.

By 1767 the fishermen on the lower Schuylkill were so active and thorough that dwellers upstream complained that fish had become scarce. A law was then passed prohibiting more than one seine or net (except hoop-net) being cast in one fishing place in the same twenty-four hours. In 1771 fishing was prohibited from sunset on Saturday to sunrise the following Monday. Evidently, the American Revolution did not end fishing concerns, because these regulating acts were reaffirmed in 1776 and 1781.<sup>4</sup>

## Shad As a Provision During the Revolutionary War

During the American Revolutionary War, fish were an important food for the Continental Army. In December 1777, more than 10,500 pounds of fish were issued to the men. This was followed in January 1778, with about 20,000 pounds of "herrings" issued at Valley Forge, and about 15,000 pounds in February. The high point of issues was reached for the period in the week of 11 May-17 May 1778, when about 22,000 pounds of fish were issued to the Army. The next week, 18-24 May, the issuance of "fish" had dropped to about 15,000 pounds.<sup>5</sup>

In February 1778, the "Committee of Congress at Camp," meeting at Moore Hall just outside Valley Forge, was already considering food supplies for the "Campaign of the Year 1779 and the Winter preceeding it." To meet part of this need it recommended "large Supplies of Fish laid up from the Rivers of Virginia particularly the Potowmack in the ensuing Spring....Dried Fish should also be purchased in the Eastern States during the Course of the next Summer."<sup>6</sup>

Delegate to Congress Gouverneur Morris wrote to a colleague on 19 February 1778, asking for "18,000 Barrils of Fish...to be laid up in the State of Virginia as many of them as possible Shad." The next day Ephraim Blaine, Deputy Commissary of Purchases with the army, wrote the Committee of Congress at Camp on his plans to visit Maryland, commenting on the "fine Shad Fisherys in that Country" and asking what price he should offer a barrel. Blaine also mentioned a man ten miles upstream of what is now New Hope, Pennsylvania, who would supply shad, but not barrels or salt. The Committee responded to Blaine the same day with a letter of introduction to the Governor of Maryland, and authorizing Blaine to purchase the shad though "The Cost on the whole will be great but [the army] must not starve."<sup>7</sup>

In early March the Commissary General of Purchases, William Buchanan, reported that there were "between 4 @ 300,000" pounds of dried fish at Baltimore. There were also "26800 Cod Fish" at the Head of Elk, but these and other stores could not be immediately brought forward due to a shortage of wagons.<sup>8</sup>

On 9 March, a committee of Congress, then meeting at York, considered Morris' recommendation of the previous month. As part of a proposal to feed the army, it was suggested that the:

"Commissary General of Purchases be directed to send his Orders to the several Deputy Commissaries of Purchases...to Contract for and secure from time to time, in the most Convenient season and places for that purpose, and in the most prudent and effectual manner possible, viz: Ten thousand barrels of Fish, well picked and saved for Use, and as many of them shad as can be procured; also Ten thousand Quintals [1 quintal is a weight of 100 pounds] of well cured and dried cod fish..."<sup>9</sup>

Congress referred the letter to the Board of War, an early precursor to the Defense Department, but ordered no specific action on fish purchases. However, the Board apparently ordered fish purchases because Horatio Gates, its president, wrote to Henry Hollingsworth at the Head of Elk (modern Elkton, Maryland), on 24 March that "The Board are pleased to hear of your Success as to dried Herrings but have been informed dryed Shad are better. However persue your own Plan."<sup>10</sup>

Meanwhile the Commissary officials at Valley Forge continued their efforts to secure food for the Army. On 21 March, John Chaloner wrote from Valley Forge to a Captain Patterson in New Jersey that "The season for procuring shad is nearly arrived You must do your utmost endeavours to procure at least 1,000 Barrels & more if possible." Militia men were authorized by General Washington to be exempted from military service to carry on the duty. Nine days later Chaloner wrote stridently, probably to Patterson, that "His Excellency Strongly urges that a large Quantity be procured—I would wish you to extend your Views beyond your own Neighborhood Securing all Fish wherever Barrels can be obtained...I wish all the shad as low as Trenton to be Secured & Barrelled." On 2 April, Azariah Dunham was requested to send to Capt Patterson "all the tight Casks you can procure for putting up of shad." Dunham was also requested to investigate a warehouse of beef barrels at Middlebrook, New Jersey to hold the shad.<sup>12</sup>

It should be noted that the fishery on the Delaware River was long established. In April 1779, Prisoner of War Thomas Hughes observing shad fishing at Easton commented "they often catch three or four thousand at a sweep." As many as 4,000 shad are reported to have been caught in one day at Burton's Ferry in Bucks County. Gloucester County, New Jersey alone was reported to have 40 fisheries that employed about 900 men in 1829.<sup>13</sup>

That shad were not in the Schuylkill by late March 1778 is evidenced by a letter Washington wrote to Francis Hopkinson at Bordentown, New Jersey. The Continental Navy Board had been ordered by Congress to move from there to Baltimore and Hopkinson offered some of the Navy's stores to the General. Washington was "obliged to you for the trouble you have taken in removing the Stores and more so for the offer of the Rice, Oil and Fish..." The Marine Committee of Congress wrote to the Navy Board on 8 April, that they "approve of the offer you have made the General of Rice, Codfish and Oil for the use of the Army."<sup>14</sup>

In early April, letters went from Valley Forge to Henry Champion at Hartford, Connecticut, and Thomas Richardson at George Town on the Potomac. Champion was asked to "procure a large quantity...recommend Shad Fish only" and Richardson to "put up all the Fish you possibly can." On 8 April, Ephraim Blaine wrote from Valley Forge to an associate in New Jersey that instead of serving with the militia "you can render ten fold more service to your Country by paying proper attention to the fisherys in your Neighbourhood. ...all the tight Barrels in Camp shall be sent to you...let no Opportunity be lost to procure all the fish you can and be very particular in salting them."<sup>15</sup>

By 9 April, the Governor and Council of New Jersey had recommended Langston Carlisle at Burlington, New Jersey to Blaine, who pleaded for him to "superintend and have Charge of the fisherys on Delaware beg you may Immediately prepare and begin to that salutary Business." The same day Blaine wrote to Joseph Hugg "the Congress have pressed me to use every Exertion in procuring Shad fish for the Army." Hugg was asked to meet Carlisle and ensure "that every method may be adopted to procure all we possibly can" and to "procure all" the salt and empty barrels "you possibly can."<sup>16</sup>



Shad did appear in the Spring of 1778. On 23 April 1778 Captain John Montresor recorded the Philadelphia "Markets plentifully supplied with Shad and herring." Two days later a Scottish officer noted "Shed fish pretty plenty" at the Market. In the Lehigh River at Bethlehem some 8,077 shad were caught between 27 April and 12 May.<sup>17</sup>

However, the shad were apparently blocked from coming up the Schuylkill River by the British Army in Philadelphia. Dr. Charles Blagden wrote that the British soldiers were instructed to keep fish from going up the Schuylkill. Blagden does not describe the method used to prevent fish from migrating upstream, but he intimates the action was successful.<sup>18</sup> Since the British had a floating bridge from Philadelphia across to the west bank of the Schuylkill, nets may have been hung from the bridge to block the fish.

Blaine, Deputy Commissary of Purchases with the army, wrote a hopeful letter on 30 April, asking: "pray what Success have you had in procuring Shad hope pretty Considerable." His assistant Chaloner wrote to Captain Patterson in New Jersey the next day, hoping "you will in the course of a very few days raise and send to Head Quarters Two Brigades of Teams Loaded with Herrings Shad and Butter.... Pray exert yourself in the Fisheries and Providing Teams to forward all the Stores in your Neighbourhood."<sup>19</sup>

The Board of War, operating out of York, Pennsylvania, had been continuing its efforts to supply the army with shad. On 20 April, Horatio Gates had written to the active Henry Hollingsworth at Head of Elk, that "pickled herring were never well liked in camp, but shad greatly admired." As salt was in short supply, smoking was recommended as an alternate method of preserving the fish. Gates' comment about shad being preferred corresponds with the observations of Nicholas Cresswell the previous April at Alexandria, Virginia. Cresswell observed a seine drawn in with nearly 40,000 herrings and 300 shad. "The Shads they use but the herring are left upon the shore useless for want of salt." On 12 May 1778, another member of the Board of War wrote Washington they had "every Reason to believe there will be twelve thousand Barrells of Shad, the greater Part whereof are smoked."<sup>20</sup>

However, transporting the fish to camp, as well as other supplies, was difficult. Wagons and drivers were chronically in short supply, and British control of the sea sometimes restricted transportation on inland waterways such as the Chesapeake Bay. Also, the financial appeal of privateering made it difficult to obtain ships and crews for transport. On 18 May, the Maryland Council, meeting in Annapolis ordered a sloop to "Mr Magruder's Fishery on Broad Creek Potowmack River" to load 280-300 barrels of fish. These were to be taken to Charlestown in Cecil County, Maryland, at the head of the Chesapeake Bay "with all Expedition" to be forwarded on to Valley Forge. The Maryland Council also remarked that Blaine had been "pressing us to forward the Provisions from this State." However, there were "great Difficulties in procuring Craft for the transportation of Provisions."<sup>21</sup>

As recruits streamed into camp in April and May, and additional regiments arrived from Lancaster, Virginia and Wilmington, Delaware, the Commissary Department was hard pressed to feed the army. Some of the troops were a day and more behind in rations by 31 May. Thomas Jones wrote that "this day I believe we will be nearly able to furnish them with Shad. after that we must trust to Providence." From 25-31 May, some 15,508 pounds of fish were issued to the troops.<sup>22</sup>

John Ladd Howell wrote to Blaine from the Head of Elk on 7 June and reported that since receiving John Chaloner's letter of 5 June, appealing for provisions that "three Brigades of Waggon Loaded with Fish from this place have gone on to Camp." He also reported that since 4 June, 480 "bundles Cod Fish" at 56 pounds each, and 42 barrels of fish had been sent from Charlestown to Valley Forge. A brigade was a dozen or so wagons. These seem to have arrived because from 1-7 June, about 18,000 pounds of fish were issued and the following week, about 42,300 pounds.<sup>23</sup>

## Shad Migration Blocked?

A record of interest is the chronological list of notations in Washington's "Daily Expences," which shows a number of references to shad. On 10 April 1778, the first reference to shad that year appears, when twelve shad were purchased. A total of nine other purchases of shad are listed in April and May. On 30 May cash was "paid a man for bringing fish as a present."<sup>24</sup> Because Washington's headquarters at Valley Forge stands but a stone's throw from the Schuylkill River, why were fish being purchased for Washington and his military family if the shad run had occurred? The only reasonable answer is that the British in Philadelphia had succeeded in blocking the mouth of the Schuylkill, preventing the shad from coming up to spawn.

Another problem with Wildes' story is the use of the cavalry to drive the fish towards the shore. At the start of the Continental Army's Valley Forge encampment, the four regiments of Light Dragoons were sent to New Jersey. While there were hundreds of horses still in camp, the cavalry was in the Trenton, New Jersey area. In fact, Colonel Stephen Moylan, commanding the mounted troops in New Jersey, had complained to Washington on 13 May, that "They have lived upon salt fish these five weeks past, which is now expended."<sup>25</sup>

Another indication that shad were locally in short supply is found in the journal of a Lutheran minister who lived at nearby Trappe. On 10 June he bought "fifteen *Sheat-fishes*, a kind of fish which comes from the sea into fresh streams in the spring and may be caught in the Delaware and the Schulkil." He lamented that they once cost six pence each, but now cost two shillings each.<sup>26</sup>

In summary, the frantic efforts by the commissary and other officials to have fish caught on the Delaware and Potomac Rivers, with similar requests going as far as Connecticut, do not support Wildes' story. The notations of shad purchased to feed Washington and his staff, the absence of cavalry units at Valley Forge, and the references to sending barrels from camp to the Delaware River for fish all further undermine the credibility of the story. As absolutely no primary sources are known to mention the incident, the miracle of the shad run at Valley Forge must be considered as just another fish story.

### **Beyond Valley Forge**

Fish continued to be a vital (though sometimes unappreciated) staple. During the summer of 1780, Joseph Plumb Martin, stationed in the West Point, New York area, remarked that:

"Our rations, when we got any, consisted of bread and salt shad. This fish, as salt as fire, and dry bread, without any kind of vegetables, was hard fare in such extreme hot weather as it was then, We were compelled to eat it as it was. If we attempted to soak it in a brook...we were quite sure to lose it, there being a great abundance of otter and minks in and about the water, four-legged and two-legged...so that they would be quite sure to carry off the fish, let us do what we would to prevent it."<sup>27</sup>

It should be noted that the descendants of the shad not eaten by the Continental soldiers, have not migrated up the Schuylkill for over 180 years. The construction of dams for the Schuylkill Navigation Company have blocked the upstream migration of the shad since 1818.<sup>28</sup> As environmental awareness increases, and efforts are made to remove dams from rivers, as recently happened in Maine, it is hoped that shad will again return to spawn in the Schuylkill River. ■

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