

# Family Poeciliidae

## Livebearers

A large family of small, fresh- and brackish-water fishes distributed across the Americas, from southern USA to Argentina. The majority of species exhibit internal fertilisation and give birth to live young. They also exhibit striking sexual dimorphism, with females being larger and deeper-bodied than males. The male's anal is modified into an intromittent organ (gonopodium) (Fig. 65) through which sperm is introduced into the female's body. Females store sperm, which can be used to fertilise several successive broods. The eyes of the embryos are occasionally visible in a blackish blotch through the female's belly, immediately in front of and above the anal. One species, guppy *Poecilia reticulata*, is one of the world's most popular aquarium fishes and has been released throughout the tropics and in various kinds of warm-water habitats

elsewhere. Guppies and mosquitofish *Gambusia holbrooki* are typically introduced to control mosquito populations. However, global studies have demonstrated that these introductions have had only limited effects on mosquito numbers, with potentially negative or neutral impacts on native fish populations. There needs to be a clear justification for these introduction programs, which are ongoing in some countries. It has been demonstrated that mosquitofish is the main or one of the main causes of the critical decline or extirpation of several populations of species of Aphaniids and other fishes.

In West Asia, only *Gambusia holbrooki* is widespread. In addition to the species discussed here, other introduced poeciliids may be present, particularly in and around cities. Specialist aquarium literature will allow their identification. **Further reading.** Meyer et al. 1985; Meffe & Snelson 1989; Miller 2005; Freyhof et al. 2020 (introductions in Arabia).

### Key to species of Poeciliidae in West Asia

1a - Male with long, sword-like prolongation of lower caudal, both sexes with a prominent, red, black, or green midlateral stripe.

.....*Xiphophorus hellerii*

1b - Male without prolongation of caudal, without prominent midlateral stripe.

.....2

2a - Pelvic of male unmodified, tip of first ray not enlarged, similar in male and female in size and shape; gonopodium long.

.....*Gambusia holbrooki*

2b - Pelvic of male modified, tip of first ray enlarged, different in male and female; gonopodium short.

.....3

3a - Body very short and deep; dorsal in male and female equal; flank often red, similar colour in both sexes.

.....*Xiphophorus maculatus*

3b - Body moderately elongate, without grey blotch on posterior part of caudal peduncle; dorsal larger in male than in female; flank not red, if with red blotches, then in male only.

.....4

4a - Dorsal and caudal in male with blue, white, or red colour; flank in male with a variable colour pattern of red, turquoise, yellow, and black blotches and short stripes.

.....*Poecilia reticulata*

4b - Both sexes with rows of small black, grey, or brown spots on flank or flank black or black mottled; male without coloured blotches or stripes.

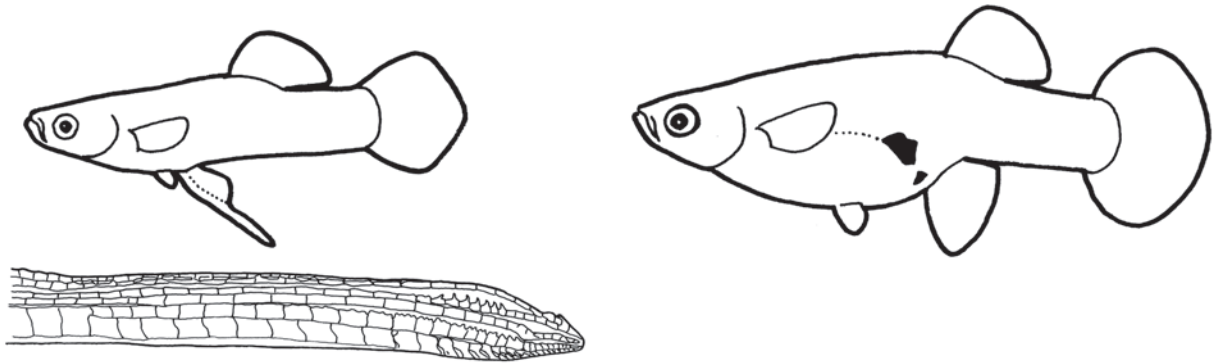
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5a - Dorsal origin above or in front of anal origin; 12–16½ dorsal rays in male forming a large sail.

.....*Poecilia "latipinna"*

5b - Dorsal origin behind vertical of pelvic origin in male; usually 9½ dorsal rays in male, rays slightly prolonged.

.....*Poecilia "shenops"*



**Figure 65:** Schematised poecilid showing sexual dimorphism in anal fin shape of male (left, **a**) and female (right, **b**), and modified anal rays of male (gonopodium, **c**) (from Kottelat & Freyhof 2007, c, after Berg 1949b).



*Gambusia holbrooki*; Lower Seyhan; female, 40 mm SL.



*Gambusia holbrooki*; Lower Tarsus, Türkiye; ~18 mm SL.

***Gambusia holbrooki***

**Common name.** Eastern mosquitofish.

**Diagnosis.** Distinguished from other species of Poeciliidae in West Asia by: ● pelvic of male unmodified, tip of first ray not enlarged, similar in male and female / ● gonopodium long ● male dull grey / ● both sexes with rows of black spots in dorsal and caudal / ○ dorsal and caudal with black spots / ○ no blue or red blotches on flank in male / ○ dorsal origin far behind vertical of anal origin / ○ no lateral stripe / ○ male without sword-like prolongation on caudal. Size up to 30 mm SL in male, 55 mm in female.

**Distribution.** Introduced throughout warmer parts of West Asia, North Africa, and southern Europe. Throughout Mediterranean basin, including Nile and Cyprus. Locally in southern Caspian basin and coastal areas of Black Sea basin. Iran and locally in Saudi Arabia (Al-Ahsa oasis, Lake Alsfar, wadis around Riyadh). Native to North America, from Delaware drainage to Florida and Alabama.

**Habitat.** Still or slow-flowing waters, usually with dense aquatic vegetation. Can survive in heavily polluted waters by absorbing oxygen from top surface layers. Often, last fish survive in heavily polluted streams.

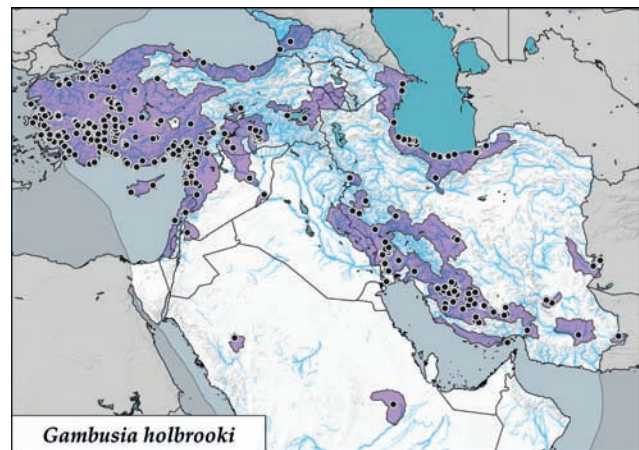
**Biology.** Matures at 4–6 weeks, three or more generations can be produced in a year. Breeds from April–October (depending on latitude), all year in south. Gestation lasts 3–4 weeks. Brood can be up to 354 young, usually between 40 and 60. Sexual activity ceases when temperatures drop below 18°C. While females continue to grow throughout their lives, males stop growing when they reach reproductive size. Feeds mainly on small aquatic invertebrates, highly opportunistic depending on prey availability. Lives below surface, catching prey at or just below surface.

**Conservation status.** Non-native; first introduced to Europe in Spain (1921) by health authorities in hope that

it would control mosquitoes (vectors of various diseases). There is no evidence that it has had any effect on mosquito populations, but there is increasing evidence that it impacts native fish, seriously threatening many endemic species.

**Remarks.** Often referred to as *G. affinis*, a species identified by details of gonopodium morphology, 5½ dorsal rays (vs. 6½ in *G. holbrooki*) and 8½ anal rays (vs. 9½). There are no confirmed records of *G. affinis* from West Asia. After the initial import in 1921, most subsequent introductions into Europe, North Africa, and West Asia were from European stocks. Still, *Gambusia* was also imported and introduced after 1921; at least one import was from the native range of *G. affinis*. Introduced populations in China are all *G. affinis*.

**Further reading.** Wooten et al. 1988 (genetics); Rauchenberger 1989 (phylogeny); Jenkins & Burkhead 1993 (biology); Doadrio 2001; Yoğurtçuoğlu & Ekmekçi 2017 (biology); Kurtul 2018 (biology and ecology); Kurtul & Sarı 2017 (risk potential); Kurtul & Sarı 2019 (distribution in Türkiye); Kurtul & Sarı 2020 (biology); Kurtul & Sarı 2021 (recognition level); Freyhof et al. 2020 (distribution in Saudi Arabia).



*Gambusia holbrooki*

**Released aquarium fishes: A looming danger?** The aquarium trade represents a significant pathway for introducing non-native species worldwide, including those in West Asia. All Poeciliid species introduced, except *G. holbrooki*, originate from aquarium populations released to the wild. Additionally, *Amatitlania nigrofasciata*, *Carrasius auratus*, *Clarias* sp., and *Pterygoplichthys* catfish have been released from aquaria and established in the wild. The dilemma faced by aquarium fish owners is evident. What should they do with the fish if they no longer wish to keep the aquarium or particular fish? Usually, these fish cannot be returned to the shop or given to other hobbyists. The fish owner is unlikely to want to kill them, so they are often released into the wild. While many hundreds of fish species are kept in aquaria, only a small number can survive and establish themselves in the waters of West Asia. Most aquarium fishes are adapted to tropical conditions and fail to survive cold winters. This is why warm springs are often where released aquarium fishes can be found. Many species are domesticated or originate from tropical rainforest habitats, making it difficult for them to establish in local fish communities. Nevertheless, numerous species are potentially able to cope with the conditions in West Asia, particularly those originating from Europe, North America, and China. Fortunately, these species are less popular in the aquarium trade. Non-native species such as *Atractosteus spatula*, *Pangasianodon hypophthalmus*, *Piaractus brachypomus*, and *Labeo rohita* are not only sourced from the aquarium trade but also originate from escapees from aquaculture facilities.



*Poecilia "latipinna"*; Hasan Abad, Iran; female, 61 mm SL.



*Poecilia "latipinna"*; Israel; male, ~50 mm SL. © M. Ford.

### ***Poecilia "latipinna"***

**Common name.** Sailfin molly.

**Diagnosis.** Character states often intermediate between this "species" and *P. "sphenops"*. Distinguished from other species of Poeciliidae in West Asia by: ● 12–16½ dorsal rays in male forming a large sail / ○ dorsal origin above or in front of vertical of anal origin / ○ no lateral stripe but series of grey or black spots organised in horizontal rows / ○ body moderately elongate / ○ both sexes with rows of small black, grey or brown spots on flank or flank black or black mottled / ○ male without coloured blotches or stripes / ○ dorsal

larger in male than in female / ○ flank not red / ○ pelvic of male modified, tip of first ray enlarged, different in male and female / ○ gonopodium short / ○ male without sword-like prolongation on caudal. Size usually up to 80 mm SL. Male larger than female.

**Distribution.** Hybrids identified as this species have been introduced worldwide in tropical and subtropical countries, including Hammar Marsh and Shatt al Arab/Arvand in Iraq and also established in Zayandeh (Iran), a wadi north of Muscat (Oman), locally in Israel and Saudi Arabia (wadis around Riyadh; Al-Ahsa oasis including Lake Alsfar,

Anik and Al-Qatif), Bahrain (Adhari Park), and probably elsewhere, and introduced to lower Nile (Egypt) and locally in Italy and Greece. *Poecilia latipinna* is native to coastal areas between North Carolina (USA) and Yucatan (Mexico).

**Habitat.** Wells and irrigation channels, drainage ditches, artificial ponds and streams, coastal marshes, lagoons, estuaries and lower reaches of rivers in brackish to freshwater habitats. Euryhaline, in fresh and even hypersaline water up to 87 ‰, usually in standing water.

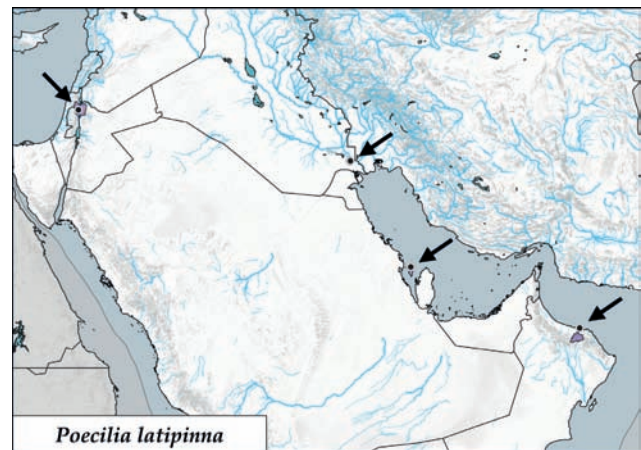
**Biology.** Mature in less than a year. Produces up to 140 young of about 8 mm SL after a gestation period of 20–30 days, depending on water temperature. Females may give birth throughout year. Males defend territories and display their dorsal fins. Only dominant males develop large dorsals and guard schools of females. Males that cannot establish territories hide in schools of females and reproduce by sneaking. Males have higher predation mortality due to their active display behaviour. Feeds mainly on algae, detritus, and small invertebrates.

**Conservation status.** Non-native; released from aquaria. Rapidly spreading and highly invasive in the northern Persian Gulf region.

**Remarks.** Non-native sailfin mollies are mistakenly identified as *P. latipinna*. *Poecilia latipinna*, *P. sphenops*, *P. velifera* and possibly others have been accidentally and deliberately hybridised in aquaria and fish farms to produce attractive aquarium stocks suitable for freshwater tanks (the pure species are mostly found in brack-

ish water). This process has not been well documented but appears to have started as early as the 1970s. Such aquarium populations have been released and may have differed considerably in their original genetic composition. The genetic make-up of non-native population has not been studied. Non-native sailfin molly occurs in two colour variants: pale beige and mottled black and beige. Pure black, silver and orange varieties are known from the aquarium trade.

**Further reading.** Ross 1985 (introduction, distribution in Saudi Arabia); Miller 2005 (distribution, identification); Coad 2010a; Esmaili et al. 2017 (introduction in Iran); Freyhof et al. 2020 (distribution in Saudi Arabia).



*Poecilia reticulata*; Oradea, Romania; female, ~30 mm SL.



*Poecilia reticulata*; Tohma drainage, Türkiye; male, ~20 mm SL.

### ***Poecilia reticulata***

**Common name.** Guppy.

**Diagnosis.** Distinguished from other species of Poeciliidae in West Asia by: ● male brightly coloured in life, with black blotches on flank also seen in preserved individuals / ○ dorsal and caudal in male with blue, white or red colour / ○ flank in male with a variable colour pattern of red, turquoise, yellow, orange, and black blotches and short stripes / ○ dorsal larger in male than in female / ○ flank not red, if with red blotches, then in male only / ○ pelvic of male modified, tip of first ray enlarged, different in male and female / ○ body moderately elongate / ○ dorsal origin behind vertical of anal origin / ○ gonopodium short / ○ dorsal and caudal without black spots / ○ no lateral stripe / ○ male without sword-like prolongation on caudal. Size up to 35 mm SL in male 50 mm SL in female.

**Distribution.** Introduced worldwide. Established in warm springs in upper Sakarya, İzmir, and upper Tohma drainages (Euphrates, Türkiye). Likely established elsewhere in West Asia. Also locally established in hot springs in Europe and in warm effluents from European power stations. Native to Venezuela, Guyana, and adjacent islands.

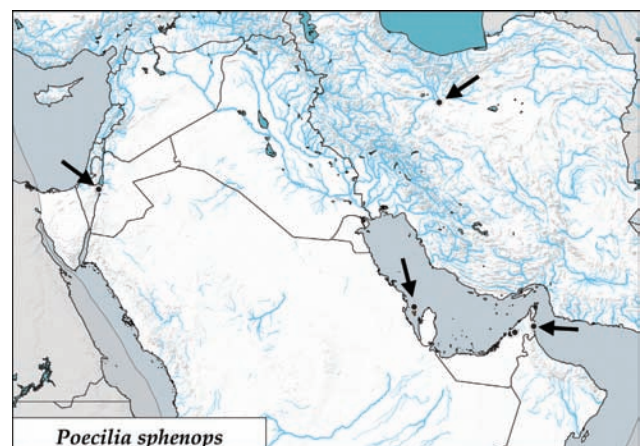
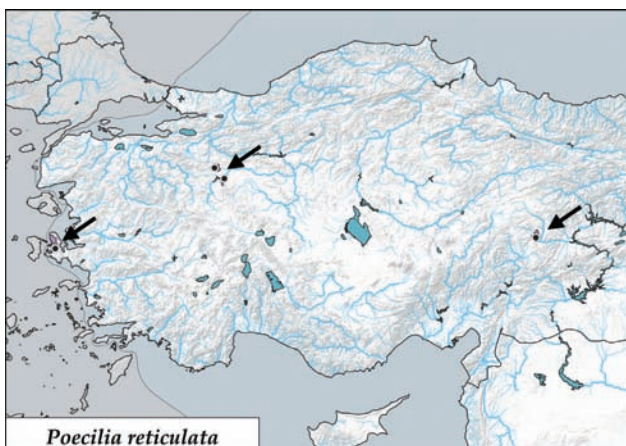
**Habitat.** A wide variety of habitats with low predation pressure. Usually found in very small streams and densely vegetated lakes and springs.

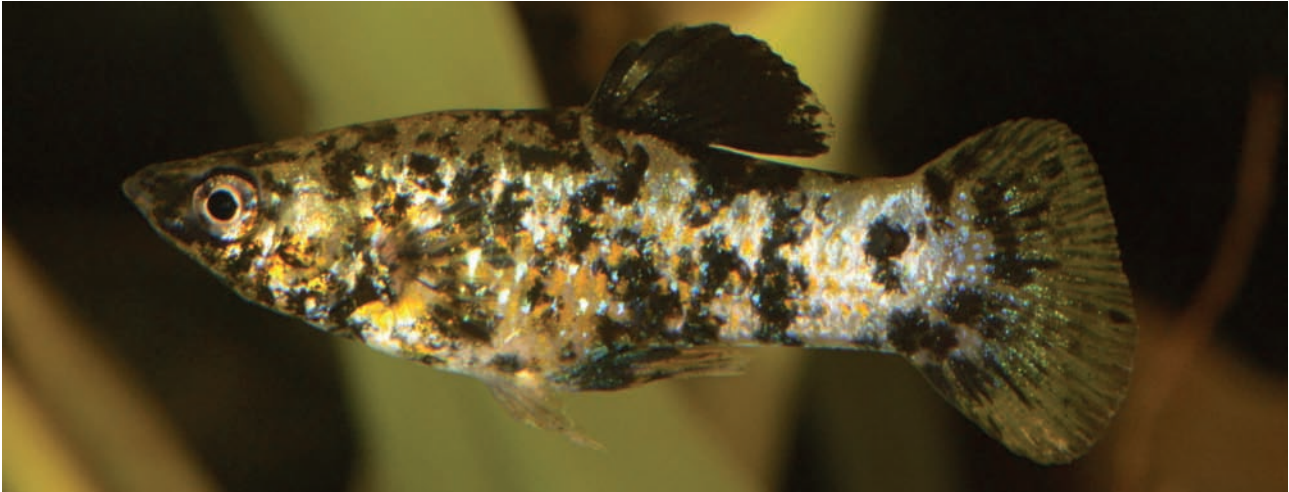
**Biology.** Not studied in West Asian populations. In captive populations, females mature at about 3 months, males slightly earlier. Continuous, non-resource and non-territorial mating system. Sexually dimorphic. Males brightly coloured and highly polymorphic with many cultivated colour forms; females cryptically coloured. Predation is a major evolutionary pressure influencing colouration, life history traits, and behaviour. Widely used as a model in biology, especially to study evolution.

**Remarks.** Despite being one of the most common aquarium fish in the world, there are few confirmed records of guppies being introduced in West Asia, with some populations surviving for more than 40 years. *Poecilia wingei* and *P. obscura* are two other guppies kept in the hobby, and hybrids between *P. wingei* and *P. reticulata* are particularly common and likely to be released into the wild. Although we identify all wild guppy populations as *P. reticulata*, this is likely incorrect. Hybrid populations with *P. wingei* are likely to occur, especially in more recently established populations.

**Conservation status.** Non-native; released from aquaria.

**Further reading.** Haskins et al. 1961 (ecology); Liley & Seghers 1975 (behaviour); Reznick et al. 1990 (biology); Magurran et al. 1995 (behaviour); Houde 1997 (reproduction); Esmaeili et al. 2017 (introduction in Iran); Freyhof et al. 2020 (distribution in Arabia).





*Poecilia sphenops*; Ruwayyah, Dubai, UAE; male, 35 mm SL. © J. Els.

### *Poecilia* “*sphenops*”

**Common name.** Mexican molly.

**Diagnosis.** Character states often intermediate between this “species” and *P. latipinna*. Distinguished from other species of Poeciliidae in West Asia by: ● usually  $9\frac{1}{2}$  dorsal rays in male, not forming a sail / ● dorsal origin behind vertical of pelvic origin / ○ both sexes with rows of small black, grey or brown spots on flank or flank black or black mottled / ○ male without coloured blotches or stripes / ○ dorsal larger in male than in female / ○ flank not red / ○ pelvic of male modified, tip of first ray enlarged, different in male and female / ○ gonopodium short / ○ body moderately elongate / ○ no lateral stripe / ○ male without sword-like prolongation on caudal. Size up to 75 mm SL.

**Distribution.** Hybrids identified as this species are locally established in Israel and Italy, at several sites in Eastern

Province of Saudi Arabia, including Al-Ahsa oasis, adjacent to Lake Alsfar, and coastal wetlands at Salwar, north of Qatif and south of Jubail. Also established in UAE for 40 years or more in Ruwayyah, a traditional plantation area inland from urban Dubai. Also, present on a recently developed golf course on outskirts of Dubai. *Poecilia sphenops* is native to Central America, from Mexico to Guatemala. Widespread in tropical areas through aquarium releases.

**Habitat.** Euryhaline, but usually in slightly brackish waters and lower parts of rivers, lagoons, marshes, and streams.

**Biology.** Matures in less than a year. Produces up to 150 young after a gestation period of about 28 days. Females give birth throughout year in warm waters. Feeds on algae and small invertebrates. Black variety (Black Molly) is a popular aquarium fish and is marketed throughout the world.



*Xiphophorus hellerii*; Euphrates drainage, Türkiye; female, ~35 mm SL.



*Xiphophorus hellerii*; Euphrates drainage, Türkiye; primary male, ~35 mm SL.



*Xiphophorus hellerii*; Euphrates drainage, Türkiye; secondary male, ~35 mm SL.

**Conservation status.** Non-native; released from aquaria.

**Remarks.** Non-native mollies are incorrectly identified as *P. sphenops*. See notes under *P. "latipinna"*. In the UAE, this molly occurs in two colour variants: pale beige and black beige mottled. In its native range, several species appear to be included in *P. sphenops*, further complicating the situation.

**Further reading.** Miller 2005 (distribution, identification); Freyhof et al. 2020 (distribution in Arabia).

#### *Xiphophorus hellerii*

**Common name.** Green swordtail.

**Diagnosis.** Distinguished from other species of Poeciliidae in West Asia by: ● prominent black, red, or green lateral stripe /

● male with a long, white or yellow sword-like prolongation with black margin at ventral part of caudal / ○ dorsal origin in front of vertical of anal origin. Size up to 78 mm SL.

**Distribution.** Israel and Iran: Two very small localities in city of Jahrom, one spring in city of Kashan and Soleymani-yeh spring in Namak Lake basin. Türkiye: warm springs in upper Tohma drainage (Euphrates). Introduced worldwide in tropical and subtropical countries, as well as in Italy and Morocco. Native to the Atlantic basin of Central America. From Rio Nautla (Mexico) southeast to Rio Sarstun (Belize).

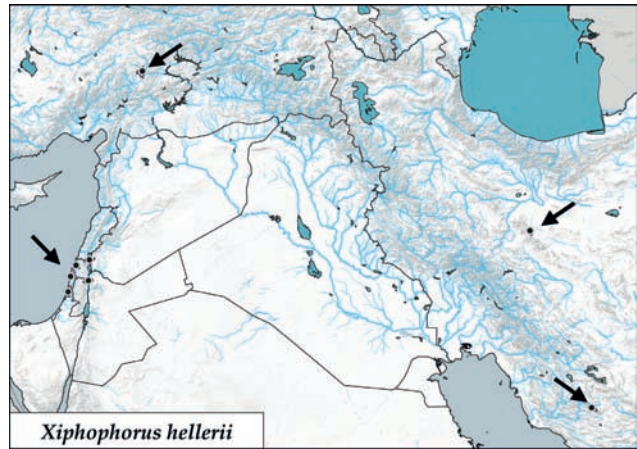
**Habitat.** Wide range of habitats in stagnant to moderately flowing waters from lagoons to springs, also in moderately polluted waters.

**Biology.** Males territorial. Breeds throughout year as long as water temperature is high enough. Primary males develop swords immediately and mature with females. Secondary males mature later, at larger sizes; some may initially reproduce as females and later change sex to males. Feeds mainly on algae, detritus and small invertebrates.

**Conservation status.** Non-native; released from aquaria.

**Remarks.** Common ornamental species. There are several breeds with different fin shapes and colours. Green and red individuals also occur in the wild in native range. Less cold hardy than *G. holbrooki* and will not survive temperatures below 15°C for over a few days.

**Further reading.** Esmaili et al. 2010 (introduction to Iran); Miller 2005 (distribution, identification).



*Xiphophorus maculatus*; aquarium trade, male, about 30 mm SL. © J. Els.

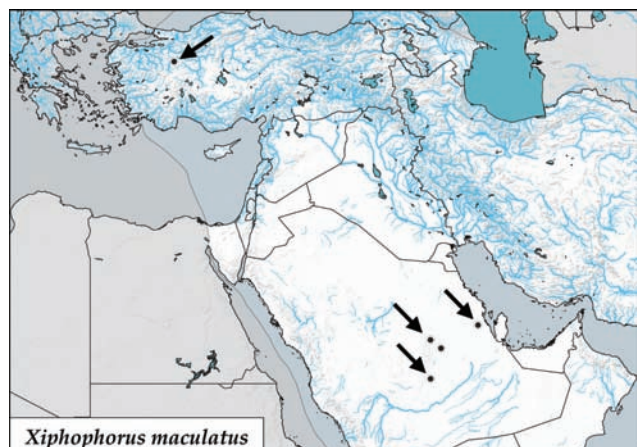
### ***Xiphophorus maculatus***

**Common name.** Platy.

**Diagnosis.** Distinguished from other species of Poeciliidae in West Asia by: ● body very short and deep / ● dorsal in male and female equally long, its origin slightly behind pelvic origin / ○ gonopodium short / ○ dorsal and caudal without black spots / ○ flank colour very variable but similar in male and female, often red or blueish / ○ no lateral stripe / ○ pelvic of male modified, tip of first ray enlarged, different in male and female / ○ male without sword-like prolongation on caudal. Size up to 45 mm SL.

**Distribution.** Saudi Arabia: Wadi Haneefah in Riyadh; Al-Kharj and Layla Aflaj south of Riyadh; and Al-Ahsa oasis. Türkiye: İnönü spring in upper Sakarya. Native from about Ciudad Veracruz, Mexico, east to northern Belize. Has established few non-native populations, for example, in Australia.

**Habitat.** Springs, streams, and canals, usually with slow-flowing water and dense aquatic vegetation.



**Biology.** Females reach sexual maturity between 5–16 weeks and at about 18 mm SL; 3–92, usually 15–30, young are born after a gestation period of 24–30 days. Breeding intervals often longer than gestation period as species can store sperm. Capable of year-round reproduction given favorable water temperatures. Some males mature early, often after 5 weeks, others mature much later; maturation strategy is genetically determined. *Platy* is a model organism in cancer cell genetics and hybridisation

research. Feeds mainly on algae, detritus, and small invertebrates.

**Conservation status.** Non-native; released from aquaria.

**Remarks.** Several colour varieties are popular aquarium fishes.

**Further reading.** Milton & Arthington 1983 (biology); Ross 1985 (introduction, distribution); Miller 2005 (distribution, identification); Freyhof et al. 2020 (distribution in Arabia); Aksu et al. 2021 (record in Sakarya).



Species of *Alburnoides* are all allopatric, superficially very similar, and found in similar habitat types. A case of functional redundancy.

**High functional redundancy of riverine fishes.** When reading or at least scrolling through this book, one pattern of freshwater fish biodiversity has caught your attention: species of fishes, as *Alburnoides*, *Barbus*, *Capoeta*, *Garra*, and *Cobitis*, all look very similar to each other. It is also a notable pattern that these morphologically similar species almost always occur in allopatry. This is what we refer to as morphological redundancy. Species in sympatry are almost always much more different from each other than species of the same genus, found in allopatry, and they are usually more distantly related. In the field, we find allopatric species usually also in the same habitats, not to mention the high structural similarity of riverine habitats all over West Asia and Europe. This suggests that morphological redundancy is related to functional redundancy. These fishes look almost the same and do nearly the same, just in different rivers. Functional redundancy may be very limited within an ecosystem, such as a single river drainage. Here, each species and its life stages are likely to make unique contributions to ecosystem functioning, naturally, much depending on the opportunities given by the ecosystem. Allopatric congeneric species are likely to exhibit a high or very high degree of functional redundancy. In West Asia, Europe, and likely elsewhere, the biodiversity of freshwater fish within genera is largely based on morphological and functional redundancy of species in allopatry. Rivers are isolated from each other by geological events, and so are the fishes. They speciate over time, but as the ecological conditions do not change significantly, allopatric speciation changes little in the ecological niches they form. They no longer live together, but otherwise, not much has changed. It is not that there are no ecological opportunities for ecological novelty and the formation of new ecological niches after or during allopatric speciation. There are a few cases of ecological novelty also from West Asia (e.g. *Garra* with reduced disc). However, the invasion of non-native species demonstrates that there are “open ecological spaces”, but native species usually fail to capitalise on opportunities. Why there is so little morphological and ecological novelty in riverine freshwater fishes and why they seem to be trapped in their ecological frame are big, open evolutionary questions.