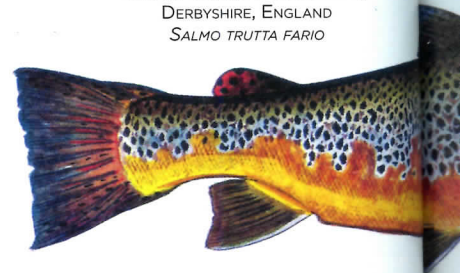


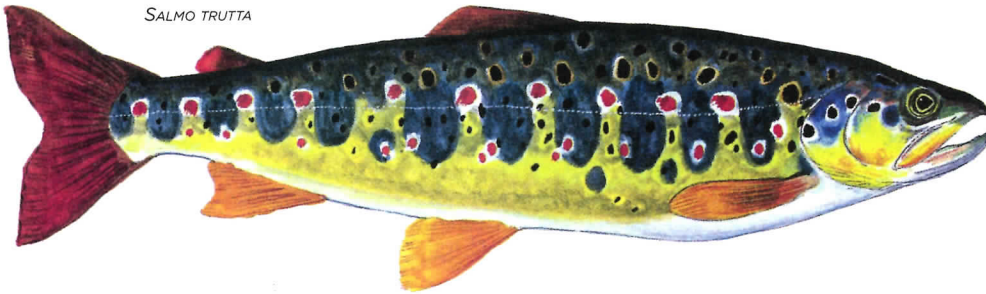
MARMORATED BROWN TROUT,  
OTRA RIVER, NORWAY  
*SALMO TRUTTA*



BROWN TROUT, LATHKILL RIVER,  
DERBYSHIRE, ENGLAND  
*SALMO TRUTTA FARIO*



BROWN TROUT, MANASTIR BROOK,  
WESTERN TURKEY  
*SALMO TRUTTA*



BROWN TROUT,  
RIO DE LA HOZ SECA, SPAIN  
*SALMO TRUTTA*



DWARF TROUT OF LAC IFNI,  
MOROCCO  
*SALMO AKAIROS*



SOFTMOUTH TROUT,  
NERETVA RIVER, BOSNIA  
*SALMO OBTUSIROSTRIS OXYRHYNCHUS*



# DARWIN'S TROUT

Jon Beer explores why fish of the same extraordinary species — *Salmo trutta* — look and behave so differently

ILLUSTRATIONS: JAMES PROSEK

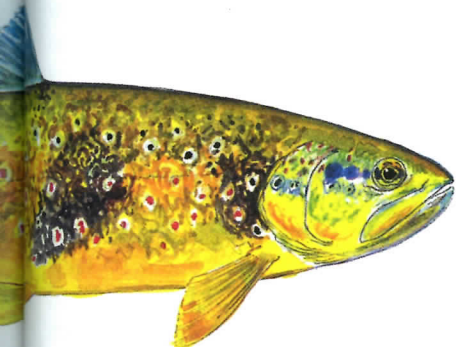
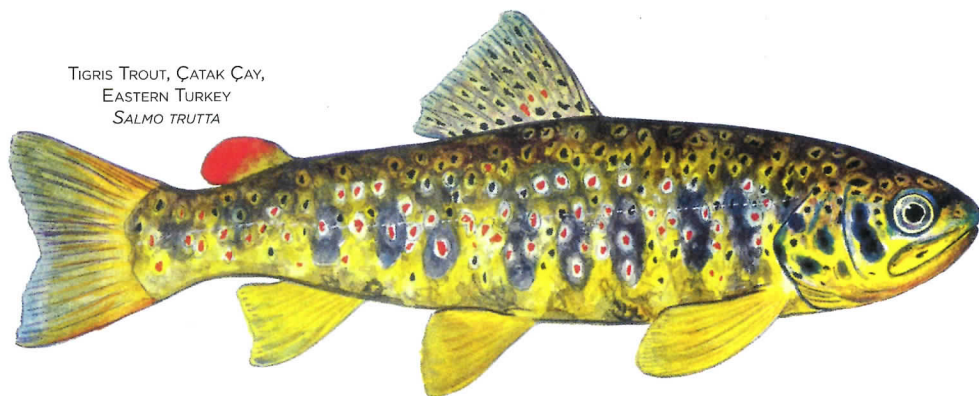
**T**HIS STORY WILL COVER continents and take in the span of human existence — but I'll start in the summer of 1996 when a young man visits a bakery.

The young man was an undergraduate from Yale on a European trip. The bakery was Bäckerei Vallant in the Austrian town of Sankt Veit an der Glan where the baker, Johannes Schöffman, made exceedingly good cakes.

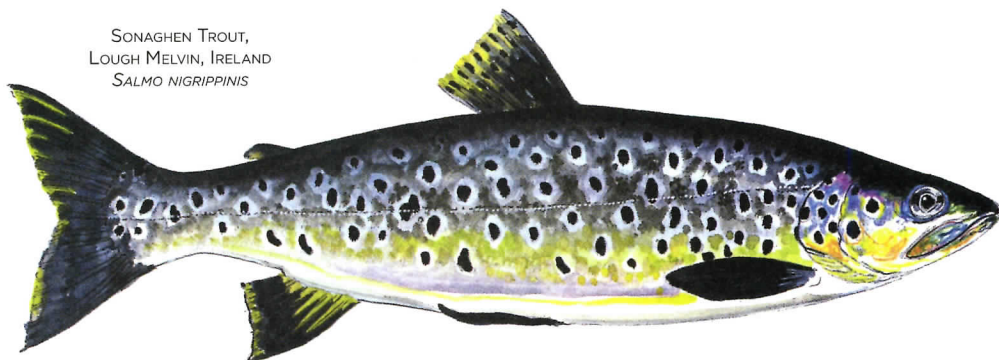
It was a meeting of remarkable men. James Prosek was a keen fly-fisher and an artist and, at just 20, had already published a book featuring the varieties of trout, some teetering on the brink of extinction, to be found in North America. The description and home water of each trout was accompanied by a



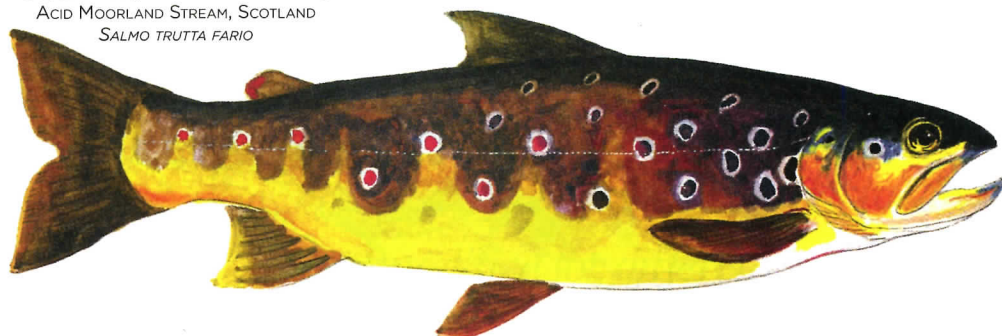
TIGRIS TROUT, ÇATAK ÇAY,  
EASTERN TURKEY  
*SALMO TRUTTA*



SONAGHEN TROUT,  
LOUGH MELVIN, IRELAND  
*SALMO NIGRIPPINIS*



BROWN TROUT, SOUTHWEST HIGHLANDS,  
ACID MOORLAND STREAM, SCOTLAND  
*SALMO TRUTTA FARIO*



stunning illustration of the fish in watercolour.

Herr Schöffman was just as remarkable. This professional baker in the family bakery in St Veit, has been described as “the world’s authority on brown trout and its relatives” and a raft of scientific papers and citations on some of the obscurer back alleys of the brown trout’s natural distribution bears this out. Which was why the young artist had sought him out. After finding and painting the varieties of North American trout, James Prosek was turning his attention to the trout of the Old World, *Salmo trutta*, the brown trout.

The following year the artist and the baker set off on an expedition through the trout streams of Italy, Greece and Turkey with the goal of recording trout in the headwaters of the River Tigris. It has a whiff of Victorian derring-do: something with a title like

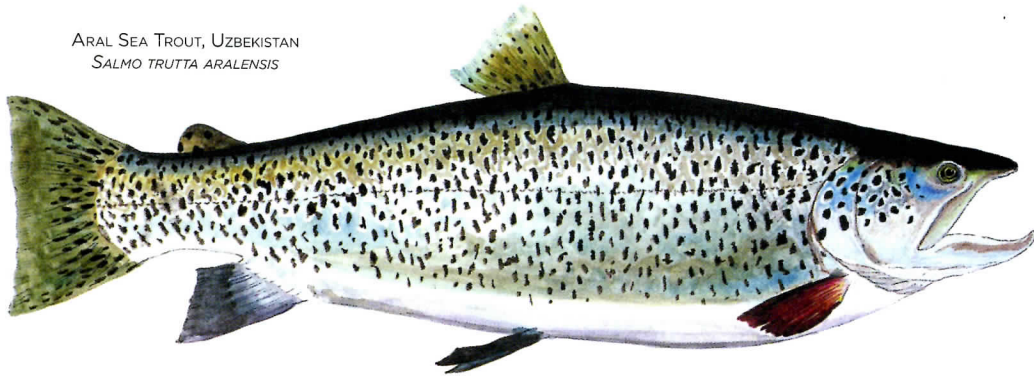
“Through Persia With Rod and Snorkel” — which gives you an idea how Johannes goes about collecting his trout specimens. Further — and farther — expeditions over the next six years culminated in James Prosek’s *Trout of the World*, a splendid celebration of the astonishing variety of salmonids in general and brown trout in glorious particular.

But you didn’t need Mr Prosek to tell you that. Anyone in the habit of catching wild brown trout will have noticed how different they can look from one loch, llyn or lough to another, from one stream to another stream. Sir William Jardine, in his towering classic *British Salmonidae* of 1841 remarked “Sometimes almost every bay has its ‘kind’ of trout; and the opposite sides of an island, a few acres in extent, oftentimes affords trout very different both in markings and in quality”. Brown >

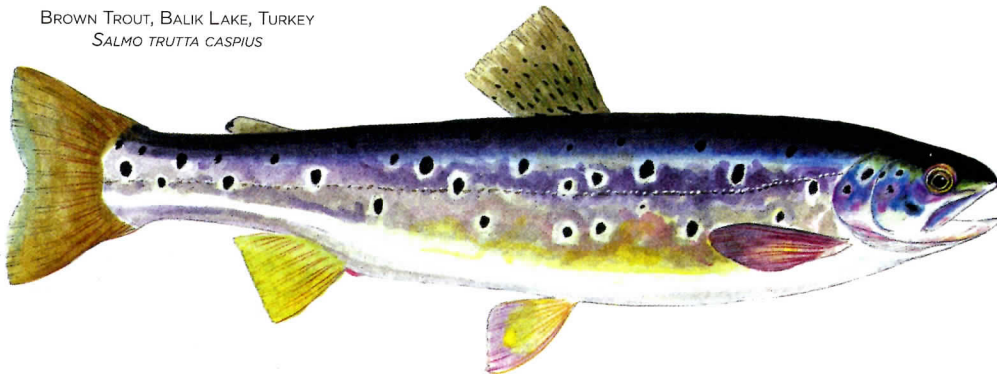


**JON BEER**  
is the president of the Wild Trout Trust. He fishes all over the world and is the author of three books: *Gone Fishing*, *The Trout and I*, and *Not all Beer and Bezencenet*.

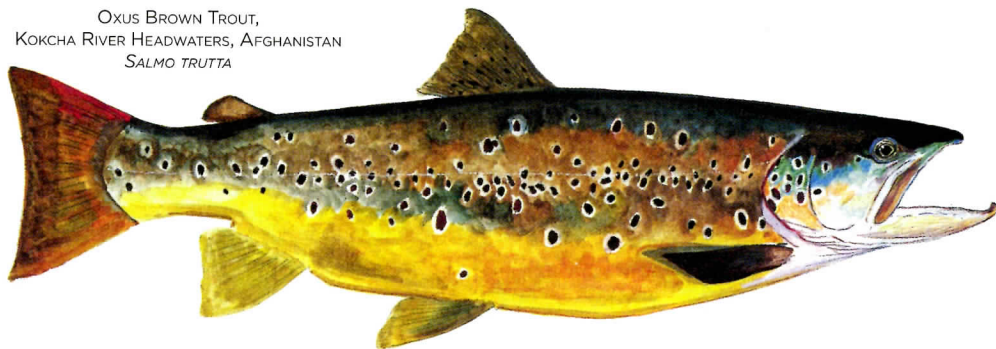
ARAL SEA TROUT, UZBEKISTAN  
*SALMO TRUTTA ARALENSIS*



BROWN TROUT, BALIK LAKE, TURKEY  
*SALMO TRUTTA CASPIUS*



OXUS BROWN TROUT,  
KOKCHA RIVER HEADWATERS, AFGHANISTAN  
*SALMO TRUTTA*



trout from different locations, even within a single body of water, can look so different that they were often regarded as different species. Take a look at the entry for brown trout – *Salmo trutta* – in Wikipedia. Beneath the scientific classification on the right-hand side there's the option to [show] *previous scientific names*. This will get you a list of previously recognised species that are now all regarded as being of the same, but highly variable, species – *Salmo trutta*. Don't bother to count them: there are sixty-four. And at least ten of those are from the British Isles alone.

Nature, of course, is not short of variety or variability. But most of that is *between* species. The extraordinary variability of brown trout is *within* the species. And that variability is not just the patterns and colours we fishermen notice and admire. They don't just look different. They can live in very different environments, eat

different things and behave very differently.

In 2013 Anders Klemetsen set out to measure this variability – in order to establish “The Most Variable Vertebrate on Earth”.

That's an awful lot of animals. Hot-blooded animals, it turns out, are constrained by their biochemistry and show very little variability within each species: he could dismiss mammals and birds. Some reptiles and amphibians have large numbers of very closely related species, but each are true species. Similarly, some fish families have vast numbers of very similar species but very little variability within each. The most variable species, he established, were among the northern fishes, with the salmonids – anything with an adipose fin – particularly blessed and bewildering. For a century and a half, taxonomists have been arguing about which trout are species and which are just variations – as Wikipedia and the profusion of

re-labelled specimen jars on the Natural History Museum's salmonid shelves will testify.

Klemetsen whittled the candidates for Most Variable Vertebrate down to ten species: nine salmonids, including the brown trout, and a stickleback. He awarded each species points for variability in ten traits. Three were obvious to the fisherman: size, colour and shape — what they looked like. The geographical range was considered along with the tendency to migrate or stay put. Variability in habitat and diet were clearly linked. Some of these species varied in their reproduction, where and when they spawned. All of Klemetsen's candidates showed some *sympatric polymorphism*, with different types of the same species sharing a piece of water: the gillaroo, sonaghen and ferox trout of Lough Melvin have been recognised by anglers for centuries and by science since the 1970s.

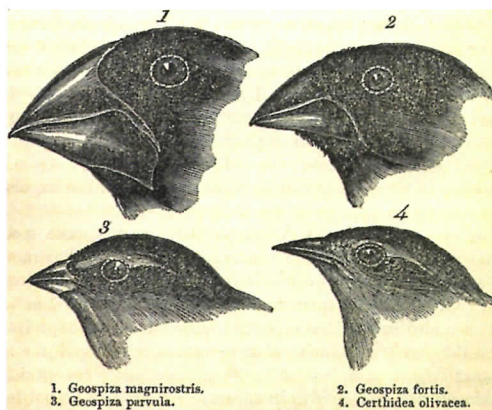
Before I reveal the results of "The Most Variable Vertebrate on Earth" let's just pause to consider what all this variability means and just how extraordinary a creature we've been chucking flies at.

Wild brown trout are found from Iceland and the Barents Sea to the Atlas Mountains of North Africa. Imagine finding reindeer in Morocco. Brown trout can, and do, live on anything from microscopic plankton to fish a third of their own length: one or two have come unstuck trying to swallow even larger brethren. A sexually mature female brown trout can weigh just 20g in a Dartmoor stream and up to 50kg in the Caspian Sea — a factor of 2500: look fondly across at the wife and do the sums for yourself. But the arctic char can double this size difference. It can also be found deeper in lakes and at higher altitudes than any of the other species. And it migrates into more oceans. Star performances like this make the arctic char the Most Variable Vertebrate on Earth. Another char of arctic waters, the Dolly Varden, is runner-up. The two trouts, rainbow and brown, come a very creditable third and fourth.

But why? Why are these fish of the north so very variable?

We'll leave them for a brief visit to the Galapagos Islands on 1st October 1835 when HMS Beagle landed at Albermarle Island, the largest of the archipelago. In his diary, Charles Darwin noted that a sandstone pit where they'd hoped to find fresh water "contained scarcely a gallon & that not good — it was however sufficient to draw together all the little birds in the country — doves and finches swarmed round its margin". This is the only diary entry to mention the finches that would be so crucial in developing his theory of evolution. The shooting of bird specimens from the islands was left to his servant, Syms Covington, and others on the expedition. On his return in 1836 the birds

and mammals collected on the five-year voyage were presented to the Zoological Society where the renowned ornithologist, Mr John Gould, discovered that the various gros-beaks, finches and wrens collected in the Galapagos were actually "a series of ground finches which are so peculiar [as to form] an entirely new group, containing 12 species". He dubbed them *Geospiza*. They are now famous as Darwin's Finches. Though closely related they differed significantly — and famously — in the size and form of their beaks, allowing the various species to exploit different foods.



Darwin's drawing of Galapagos finch species

*“From an original paucity of birds in this archipelago, one species had been taken and modified for different ends.”*

In 1845, in *The Voyage of the Beagle*, Darwin described the finches' beaks in more detail. Their crucial significance was dawning on him. "Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends".

It would be another 14 years before he published *On the Origin of Species by Natural Selection* — but the essence was there in that sentence.

At some time since the volcanic Galapagos Islands erupted from the seabed, a very lost and lucky pair of little birds fetched up here, 600 miles from South America. They found a functioning ecosystem with plants, insects and sea birds. And possibly, by that time, reptiles. But, crucially, no small land birds. And so they set about filling the ecological niches usually occupied by everything from wrens to ▶

A typical gillaroo trout — this one from Loch Gorm on Islay rattled with snails.



blackbirds by evolving specialist tools — beaks — to exploit the islands' smorgasbord.

North-west Scotland is hardly the Galapagos. It did not emerge pristine from the ocean. Its primordial rocks were high and dry and teeming with a full complement of life at the beginning of the Pliocene, 10 million years ago, when the Galapagos Islands were barely a burp on the ocean floor. The oldest Galapagos island is around four million years old. The youngest is around half a million years old. *But that is fifty times older than the oldest Scottish loch or river.*

Two million years ago, while the equatorial Galapagos was going about the business of burgeoning life, the earth entered its latest ice age when, in several waves, the arctic ice cap grew to envelope much of northern lands of Europe, Asia and North America. In the last — or the latest — of these waves the ice cap extended to the Bristol Channel. As this ice cap began to retreat, 12-15 thousand years ago, it left behind a land scoured of life. And littered with numberless icy puddles. *Very few of the world's lakes are more than ten thousand years old.*

As the ice cap shrank and the glaciers retreated up the valleys, then as now, arctic char were close behind, swimming up from the sea through the meltwater to spawn in the gravels. And as summers lengthened and invertebrate life returned, some of those char would stay, taking up residence in those countless thousands of icy puddles. And, like the small finches that fetched up on Galapagos, these arctic char had the place all to themselves. And, like the finches, some began to specialise, working their way into one ecological niche or another. Which is why four different types — morphs — of arctic char share the waters of Iceland's largest lake, Þingvallavatn. One is predominantly a fish-eater, another specialises in the plankton of mid-water. The other two, one large one small, exploit the bottom of the lake. A similar division of resources

## “North-west Scotland is hardly the Galapagos”

is found between the four arctic char morphs in Tinnsjøen, a deep lake in southern Norway and in Loch Rannoch in the highlands of Scotland. And presumably in many thousand other lakes left by the retreating ice.

The trout were not far behind, following the arctic char into these cold rivers and lakes where they too took up residence and set about dividing the spoils. And with similar results — the sympatric polymorphism first revealed by Andy Ferguson in Lough Melvin in the 1970s: the large fish-eating ferox, the sombre sonaghen hoovering up the plankton in mid-water, and the brightly-coloured gillaroo browsing on the snails and other creatures of the lake bottom. These different morphs of trout still share Lough Melvin with the arctic char. There are no char in Loch Laidon, immediately upstream of Loch Rannoch with its three char morphs. But in Loch Laidon, in 2018, Eric Verspoor found four distinct trout morphs. And by now you've probably got a rough idea how each makes its living.

The brown trout morphs in these examples are sympatric: they share the same water, they can mix at will — but don't. Brown trout from different waters, in different lakes and rivers from different catchments, with different climates and geology, can and do vary much more. Which begs the question: which are different enough to be different species? Taxonomists continue to argue about this. It'll be clearer, perhaps, when the ice has been gone for as long as the Galapagos has had finches.

Meanwhile, for the angler, it really doesn't matter. Take another look at James Prosek's specimen studies. They are all wild brown trout. They are all the same species. And they are all very different.

Let's celebrate — and cherish — the difference. ■

### Buy the book

The illustrations are taken from the latest edition (2013) of *Trout of the World* by James Prosek, published by Abrams. It features 75 superb watercolour illustrations of brown trout varieties and a further 45 of salmon, chars and North American trout.

