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## Gessner's taxonomical skill exhibited in his discussion of *Felchen*

While Conrad Gessner is not often praised as a taxonomist, the fourth volume of his *Historia animalium, De Piscium et Aquatiliū animantium natura* (1558) which deals with aquatic animals, shows a strong focus on sorting species into groups based on their physical characteristics. This organisation takes place across the alphabetical arrangement of the work, through a consistent nomenclature which refers to broader groups of species, and by referring to other members of a group in descriptions of species. In Gessner's later ichthyological publications, the *Nomenclator aquatiliū animantium* (1560) and the *Fischbuch* (1563), this organisation also takes place across the physical organisation of the books, which is based on habitat. This approach is more pronounced here than in Gessner's work on other groups of animals, perhaps due to the abundance of aquatic species described. Containing descriptions of around 700 species *De Piscium* is by far the most extensive volume of the *Historia animalium*. Textual space is saved by describing some species more extensively while the descriptions of other related species refer to those descriptions and thus can be much more brief without loss of information.

Gessner's discussion of coregonids or, in German, *Felchen*, can serve to highlight this approach. *Felchen*, in current taxonomy classified as the genus *coregonus*, can be found at locations with high altitudes and low temperatures such as Switzerland and Scandinavia, and as a result are absent from the classical literature as well largely absent from the ichthyological literature produced by many of Gessner's contemporaries, including Paolo Giovio,<sup>1</sup> Hippolito Salviani, and Pierre Belon. Gessner on the other hand was ideally located to describe these species, twenty-three of which occurred in Switzerland.<sup>2</sup> Tied in with his discussion of *Felchen* is his discussion of a wider group of salmonids which Gessner describes as *truttae*, of which *Felchen* form a subgroup, both in Gessner's work and in current taxonomy. Due to the variety of species, the occurrence of both freshwater and migrating species with-

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1 Giovio (1524).

2 Two *Felchen* species, *Coregonus fera* (not to be confused with *Coregonus palaea* which was introduced in Lake Geneva after the *C. fera* was extinct and is now often called *fera*) and *Coregonus gutturosus*, are known to have gone extinct since the sixteenth century. Kottelat (1997).

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in this group of salmonids, Gessner's *truttae*, and of varying morphologies within the same species, description of this group requires profound taxonomical insight.

## Sources and distinct approaches to description

Gessner's presentation of fish species as members of groups consisting of physically similar species, combines two approaches to description. We see these represented in the two sources on which he most relied for his discussion of *Felchen* and the wider group of salmonids in which these are placed. Because classical literature is relatively limited on the topic of fish,<sup>3</sup> *De Piscium* relies to a great extent on observation and contemporary sources. For this particular group, Gessner based himself primarily on Guillaume Rondelet's 1554 *Libri de piscibus marinis*. In addition, he obtained information from his acquaintance Gregor Mangolt's 1557 *Fischbuoch*, which discusses species native to Lake Constance,<sup>4</sup> and supplied him with detailed information on *Felchen*. More information was obtained from Pierre Belon's 1553 *De aquatilibus*, Hippolito Salviani's and Paolo Giovio's ichthyological work, Aristotle's, Pliny's, Aelian's and Columella's descriptions, acquainted scholars, and fishermen. The information obtained from these sources was however limited and served to supplement Rondelet and Mangolt.

These publications are distinctly different in the range of species they describe and in their approach to description. Throughout Rondelet's ichthyological work, identification of species is emphasised to a much greater extent than the physical similarities between certain species. Rondelet describes seven salmonid species from across the south-west and south of Europe, the salmon (*Salmo salar*), trout (*Salmo trutta*), grayling (*Thymallus thymallus*), arctic char (*Salvelinus alpinus*), Lake Garda trout (*Salmo carpio*), and two types of *Felchen*, *Coregonus wartmanni* and *Coregonus fera*. Rondelet briefly notes a similarity between these species,<sup>5</sup> however this similarity receives little attention. The descriptions focus on physical characteristics, habitat, and habitus as aspects which identify the described species as distinct from others.

<sup>3</sup> In Antiquity only a fraction of existing aquatic species was described. Pliny described 131, Aristotle 117, and other sources fewer than this. In order to place these number in context, it is worth noting that currently 34100 species of fish have been identified. To this should be added that many aquatic species that can found be outside the Mediterranean are not among the species described in Antiquity.

<sup>4</sup> Including salmonids, sculpins, cyprinids, perches, eels, esocids, loaches and catfishes.

<sup>5</sup> Rondelet (1554), p. 160: "[...] *quam vis sit is quoque in Truttarum sive Salmonum genere*", p. 161: "*Truttas salmones esse fluviatiles vel lacustres nemo est qui negare possit*", p. 162: "[...] *quem Salmonum Truttarumque generi adiungendum esse suaderet pinnula illa dorsi posterior adipose Salmonum & Truttarum generi propria*", p. 163: "*Ut Lavaretum lacus Burgetius & Aequibeletius ferunt, ita Lemanus Bezolam vulgo dictam, non admodum dissimilem*", p. 164: "*Lavaretos [...] referens*", p. 172 "*Piscis est ex Truttarum genere*".

Contrary to Rondelet, Gregor Mangolt displays little focus on the distinction between individual species, providing what are in fact practical descriptions of types of fishes. In a single description Mangolt mentions different types of *Felchen* with different preferred habitats.<sup>6</sup> No further information which could serve to distinguish between these varieties is provided. Instead, much information is provided on catch and consumption, on the spawning process of these fishes and the effect this has on their taste, and on local nomenclature. Much of this was absorbed into Gessner's descriptions. While Mangolt was not targeting a scholarly audience, Gessner's enthusiasm for his *Fischbuoch* is evident from the fact that he took it to be printed, even though Mangolt had not given his permission.<sup>7</sup> In Gessner's work both the approach to description as we see this in Rondelet's ichthyological work and the approach we see in Mangolt's work is visible. His descriptions of salmonids identify these as belonging to two groups. Firstly the *Felchen*, which he calls "*Albulen*" in German and "*albulae*" or "*lavareti*" in Latin, and secondly a broader group which incorporates the "*albulae*", which he calls *Forellen* in German and *truttae* in Latin. Descriptions of both the *truttae* and of the "*albulae*" as a group are provided. In addition, a number of individual species are described.

## Description of the "*albulae*" as a group using consistent nomenclature

How are the various species described in relation to the wider group of the "*albulae*"? Gessner's description of this group runs over several pages and is interlaced with descriptions of several individual species.<sup>8</sup> In addition to the outline of the group three distinct species are described in the *Historia animalium* and in his *Nomenclator Aquatilium Animantium* (1560).<sup>9</sup> In the *Fischbuch*, (1563) one more was added.<sup>10</sup> The description of the group describes the connected species as "*albulae*" and as "*lavareti*", and similarly the descriptions of the individual species consistently point out these are "*albulae*" or "*lavareti*".<sup>11</sup> Consequently a consistent nomencla-

6 Mangolt (1557), pp. 26–27: *Von Felchen, Balchen und Blauwlingenn*.

7 At this occasion, the work was interleaved with depictions from a fish calendar published a few years earlier by Conrad Gessner and Jacob Ruf. This provides instructions on which fish to eat during which month of the year, and includes twelve woodcuts each showing two 'fish of the month'. Gregor Mangolt had intended his work on fish from Lake Constance to be published as part of a chronic of the city Constance, which remained unpublished. Mangolt (1556). Keller (2008), pp. 967–993.

8 Gessner (1558), pp. 33–34 and 35–37; Gessner (1560a), pp. 340–341; Gessner (1562a), f. 187v.–188r.

9 Gessner (1558), pp. 35, 37 and 39. Gessner (1560a), pp. 340–342.

10 Gessner (1562a), f. 189r.: "*Von dem Angelin*".

11 Gessner (1558), p. 35: "*numero Lavaretis similis.*" and p. 37: *De Albula Nobili "consentiunt candor et praestantia in genere albularum"*, p. 39: "*De Albula Minima*".

ture links the various species to the wider group. Relatively few species are individually described, although the description of the group indicates this is made up of various species which are common in Switzerland.<sup>12</sup> It also explains how this knowledge may have been obtained, as it is mentioned that Gessner spoke to fishermen.<sup>13</sup> Taking this into consideration, we can assume that Gessner was familiar with far more species than the four included and consequently it appears the choice to only specifically describe four was a conscious limitation.

## Distinguishing the “*albulae*” from other *truttae* based on physical characteristics

The description of the “*albulae*” points out that this group is connected with a wider group of salmonids which includes the salmon and the trout. A limited list of characteristics which they share with this wider group is provided to back this up. Most importantly, this includes an adipose fin, which other types of species do not have.<sup>14</sup> This small, rayless, fleshy dorsal fin is almost unique to the *Salmonidae* family. In addition, characteristics shared by all “*albulae*” which set them apart from other salmonids are listed. In the description of the *Coregonus Wartmanni* for example, it is observed that other than most salmonids they do not have teeth, they have a smaller head, they do not have spots of colouration on the body, and they have white flesh.<sup>15</sup> Such shared characteristics aside, the descriptions of the individual “*albulae*” species pay much more attention to those characteristics that can help distinguish them from one another than to those characteristics they share, consequently the various species can be identified.

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<sup>12</sup> Gessner (1558), page 35: “*Alborum piscium lacustrium unius generis species, ut dixi, multae sunt, aliae atque aliae in diversis lacubus, itaque nomina etiam multa cariaque sunt, non modo specie differentium horum piscium, sed etiam eorundem in lacubus et regionibus diversis.*” “*Nam et nostri speciem unam vulgo Albelen a colore vocant, haec nomina generis si admittantur, species pro magnitudine distinguuntur, magnae, mediocris aut parvae differentia albulae adiecta; vel coloris, vel praestitiae et nobilitatis.*” Gessner (1560a), p. 340: “*Nostras vero caeruleas, tanquam specie diversas, nobilibus magnitudine et natura similes, in superficiem quoque similiter ferri, et cetera. Ita in diversis lacubus diversae, et quibusdam forte peculiare huius generis species sunt.*”

<sup>13</sup> Gessner (1558), p. 35: “*Et ipsi piscatores in diversis regionibus per omnia consentiunt*”, p. 37: “*piscatores hoc genus caeruleis praeferunt*”, and page 38 “*piscatores nostri contradicunt*”.

<sup>14</sup> Gessner (1558), p. 33: “*Quem Salmonum Truttarumque generi adiungendum esse suaderet pinnula illa dorsi posterior adiposa Salmonum et Truttarum generi propria.*” Also in the description of the *truttae* group is pointed out that all these species possess an adipose fin. Gessner (1558), p. 1199: “*Id omnibus commune est, quod posteriorem dorsi pinnam parvam habent et subrotundam, pinguemque.*”

<sup>15</sup> Gessner (1558), p. 33: “*os sine dentibus, caput compressum, corpus maculis carens, caro mollis et candida.*”

All four discussed “*albulae*” can be identified based on the characteristics that are provided. The “*Adelfish*” or “*Lavaretus*”<sup>16</sup> is said to be found close to the surface, among other locations in Lake Constance, and to spawn in November.<sup>17</sup> These characteristics are sufficient to identify this species within this group as the *Coregonus wartmanni*.<sup>18</sup> Gessner describes the species as an “*albula*”. Similarly, the “*Albula ferra*”<sup>19</sup> can quite easily be identified. The description states this can be found in Lake Geneva,<sup>20</sup> has a relatively broad body and head, is grey and about a cubit in size.<sup>21</sup> This suggests this might be the currently presumed extinct *Coregonus fera*.<sup>22</sup> Although the species could be found in nearby Lake Geneva, Gessner's description is brief, in the *Historia animalium* as well as in the *Nomenclator* and in the *Fischbuch*. This suggests that, contrary to the *wartmanni* which he mentions he has seen,<sup>23</sup> Gessner did not study this species himself. He does however mention an acquaintance who wrote to him about it.<sup>24</sup> Like the *wartmanni*, the *ferra* is specifically described as an *Albula*.

As the previous two, the “*Hägelin*”,<sup>25</sup> which is caught in Lake Zurich,<sup>26</sup> is described as a type of “*Albula*”. This species is described as smaller than the others,

16 Gessner (1558), p. 37; Gessner (1560a), p. 340; Gessner (1562a), p. 187. Figure 1. The illustration is copied from Rondelet (1558), p. 118.

17 Gessner (1558), page 37: “*Albulam nobilem voco piscem qui Constantie Adelfelch appellatur [...] Audio has albulas minas profunde propius ripam agere [...] preasertim Novembri mense.*”

18 While Gessner's nomenclature suggests this might be the *Coregonus lavaretus* or the *Coregonus nobilis*, these species could not at the time be found in Lake Constance. Mangolt provides some insight into which species were most likely present here. This most likely includes the *Coregonus wartmanni*, the now extinct *Coregonus fera* and the now extinct *Coregonus gutturosus*. Ribi (1942), p. 79 and 121–122. As the *C. fera* spawned in February, the *C. gutturosus* used to spawn in July–November, and the *C. wartmanni* spawns in the first half of December, the species described here could be the *C. gutturosus* or possibly the *C. wartmanni*. However, as Gessner points out this species can be found nearer to the surface than many other species in this group, it cannot be the *C. gutturosus*, which could be found only at great depths.

19 Gessner (1558), p. 35; Gessner (1560a), p. 341; Gessner (1562a), f. 188 r, figure 2. Illustration copied from Rondelet (1558), p. 112.

20 Gessner (1558), p. 35: “*Est et alius piscis Lemani lacus*”.

21 Gessner (1558), p. 35: “*magnitudine cubitali, ore parvo sine dentibus [...] colore cinereo, corpore depresso et lato [...] caudam latissimam. Carne est candida*”. NB: Throughout Gessner's ichthyological work the maximum size fishes can reach is listed, rather than a range. A Zürich cubit was about 60,28 cm. Kläui (1942), pp. 99–102.

22 Not to be confused with a coregonid now present in Lake Geneva under the name *fera*, this is in fact the introduced *C. palaea*. The *Coregonus fera* was last recorded in 1920 but was formerly very common in Lake Geneva. Extinction is thought to be due to overfishing in the 1900's. Kottelat and Freyhof (2007), p. 646.

23 Gessner (1560a), p. 341: “*Mihi quidem species duae unius generis proxime videntur*”.

24 Gessner (1560a), p. 341: “*Amicus quidam noster in catalogo Lemani piscium, Palam et Ferram species Bizolae diversas facit: et Ferram longissimi a ripa capi scribit.*”

25 Gessner (1558), p. 39; Gessner (1560a), p. 342; Gessner (1562a), f. 188 v, figure 3.

26 Gessner (1558), p. 39: “*maxime a pago Vaedevilla*”, mostly near Waddichweil.

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detur lepisculi significare, forte quod agilitate ac celeritate natandi lepotes representent. Quos nostri Schwalen, Lucernæ Hasle uocant. Kolschisch dicti Colonie non sunt omnino dissimiles piscibus Dunnen, id est Capitonibus, sed minores.

Hasle nostræ, (quas cephalos aut mugiles fluviales minores dixerim, nam fluvialium cephalum siue squalum, multo magis quam leuciscis supra dicti referunt, pisciculi sunt molles, duos aut tres palmos longi, albicantes, per dorsum in uiridi nigricantes, cauda & pinna dorso glaucis, cæteris rubicundis: minime lati. Squamulis tenuibus, argenteis, branchijs ternis. Caro eorum aristis rubra est, ut & mugilum fluvialium maiorum. Ex his qui in fluuio apud nos capiuntur, oculis rubere audio: qui in lacu non item. Obseruati postea lacustres superna oculorum parte flauere. Dentes in faucibus utrinque conditos habet ut Capito fluvialis, in mandibula curua, exteriore ordine quinque: maiusculos, interius binos minores, omnes ferè in summo leuiter aducos.

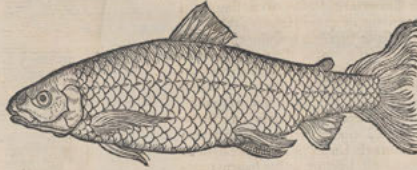
Parere incipiunt medio Aprili uel paulò ante.

Suo tempore (Maio & Aprili præcipuè, deinde Iunio & Iulio: à Maio quidem mense etiam Westfisch alicubi nominantur) satis grati in cibo & salubres habentur. Aliquando uerò uermes eis innascuntur, (sigulas nostri uocant, nestel) & omnino insalubres fiunt. Hyeme macri sunt ac minime placent. Fluviales etiam lacustribus præferuntur. Elixari debent in uino feruido. Circa initium Nouembris oua in hoc pisce reperi, quæ magis quam piscis placebant.

20 SEQUUNTUR PISCES ALIQVOT LACVSTRES, QUOS ALBIS ADNUMERAMVS: NAM ET GERMANICE FERÈ COMMVNINOMINE ALBI DICUNTUR: & omnes propè generis unitus species uidentur, omnes lacustres tantum, squamosi, edentuli, pinna in dorso duplici, una in medio maiore, altera ad caudam parua ut truttar. Carnis substantia alba, friabilis, non insalubris, & sapore propemodum similes, &c.

PRIMUM AVTEM ILLOS PONAM QUOS RONDELETIVS descripsit: deinde & nostras de singulis obseruationes, & alios eiusdem generis addam.

30 DE LAVARETO PISCIS LACVSTRI A PVD ALLOBROGES, RONDELETIVS.



40 NERNACVLIS & proprijs uocabulis in rebus nostris explicandis ueterum nominum penuria uti cogimur: ut in pisce qui in lacubus Allobrogum tantummodo reperitur nominando, uulgi appellationem sequimur & Lauaretum uocamus, quem Salmonum Truttarumque generi adiungendum esse suaderet pinnula illa dorso posterior ad ipsa Salmonum & Truttarum generi propria, nisi multa alia reclamarent, ut oris constitutio Thrisis quam Salmonibus similior, os sine dentibus, caput compressum, corpus maculis carinis, caro mollis & candida, Lauaretum igitur inter Salmones & Alofas ambigere merito dicemus.

Is quod nunquam fordidus sit, sed bene ablutus, ob munditiem & candorem nomen habere uidetur. Lacum Allobrogum proprius est, ut Burgetij, & Aquebeletij, Nec ullus est qui in Italia, Germania, Gallia, aut alibi uspiam uiderit.

50 Pedali est magnitudine, corpore utcumque compresso, Alofa uel Harengi modo: eos enim pisces capite & ore planè refert. Maxilla dentibus caret, superioris latera inferiora operiunt & claudunt. Corpus squamis tegitur argenteis. A branchijs per medium corpus recta linea descendit. Pinnas duas ad branchias habet, totidem in medio uentre, proxime anum pinnulam unicam,

Fig. 1: The "Adelfisch" or "Lavaretus". Conradi Gesneri medici Tigurini Historiae animalium liber III. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 33 (ZBZ, Alte Drucke und Rara, NNN 48).



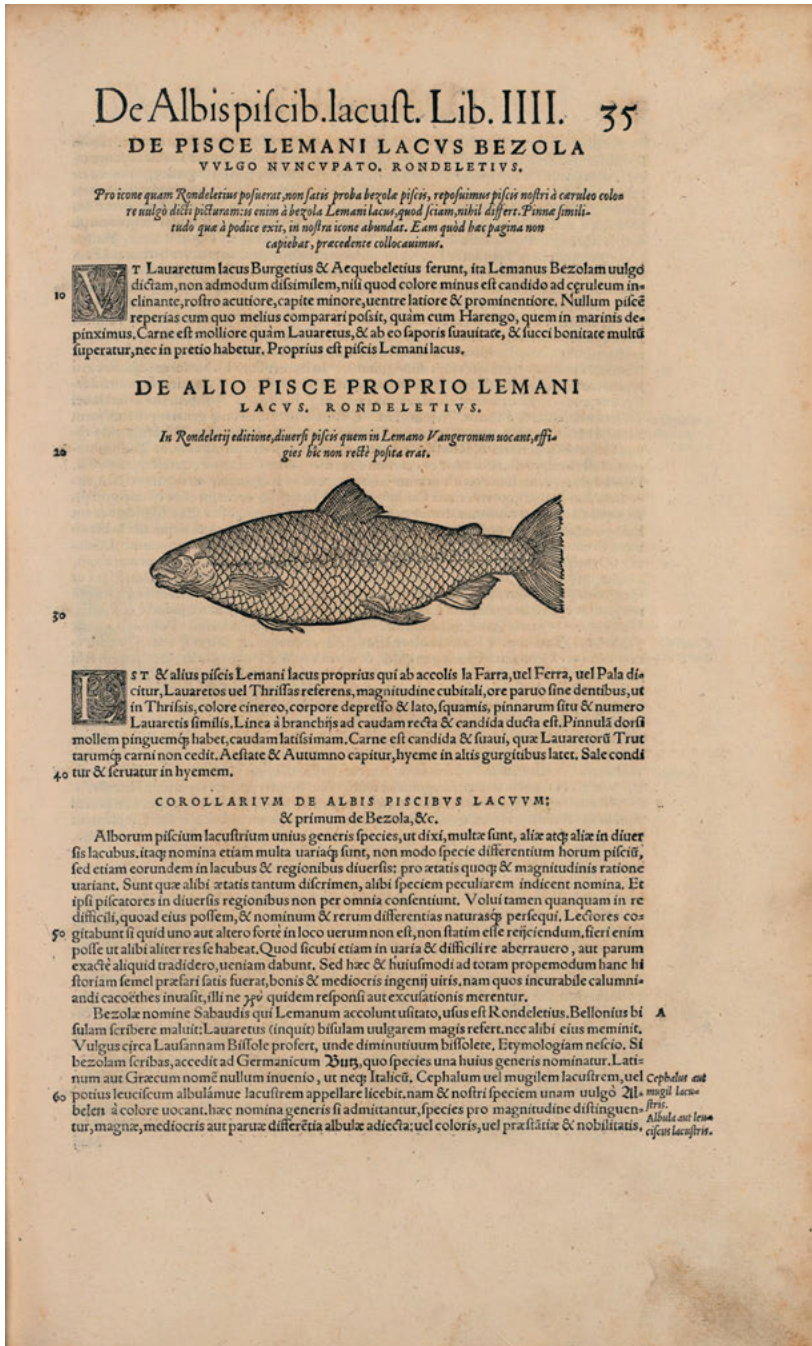


Fig. 2: The “Ferra” or “Albula ferra”. Conradi Gesneri medici Tigurini Historiae animalium liber III. qui est de piscium & aquatiliū animantium natura. [Zürich]. Tiguri: apud Christoph. Froschovorum, anno 1558, page 35 (ZBZ, Alte Drucke und Rara, NNN 48).

with less green colouration on the head, with a somewhat pointy snout, and as spawning in July.<sup>27</sup> This suggests this might be the *Coregonus heglingus*.<sup>28</sup> The included depiction<sup>29</sup> of a small and slender fish, and especially the slightly pointy snout confirms this. Mangolt nor Rondelet described the *Coregonus heglingus*, and it appears Gessner's description of the species is its first mention in scholarly literature. Based on the information he provides on catch it is likely that Gessner obtained information on this species from fishermen.

The 1563 *Fischbuch* includes a fourth species, the “*Angelin*”.<sup>30</sup> As the other species, this is described as an “*Albulen*”. The description states the species is as “white as snow”, and is present in Lake Biel. The fact that the description is very brief and that no depiction was included indicates Gessner did not personally observe the species. Since the *Fischbuch*, intended as a popularisation of *De Piscium*, was not produced by Gessner himself but rather by Konrad Forer, this may not be Gessner's own addition. Either way, based on the description, the species can still be identified as the *Coregonus albula*. This species is notably lighter than most *Felchen* and could be found in Lake Biel.

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**27** Gessner (1558), p. 39: “*minor est, et in capite minus viridis. [...] os habet longiusculum [...] Iulio coeunt.*”

**28** The remark about the pointy snout and the size of the species raises the question if this might be the *Coregonus oxyrinchus*, which only grows to about 50 cm and has a very distinctive long snout. However this species spawns much later in the year than is described here, in October or November. In addition the nomenclature Gessner provides suggests this may be the *Coregonus heglingus*, which has a slightly less, but still quite, pointy snout. The observation that this species spawns in July confirms this, and at 25 cm maximum the *heglingus* definitely fits the description as a small species.

**29** The woodcut is based on a drawing from Gessner's collection. Platter, University Library Amsterdam Ms C III 22, f. 28 (16th century).

**30** Gessner (1562a), f. 189r.



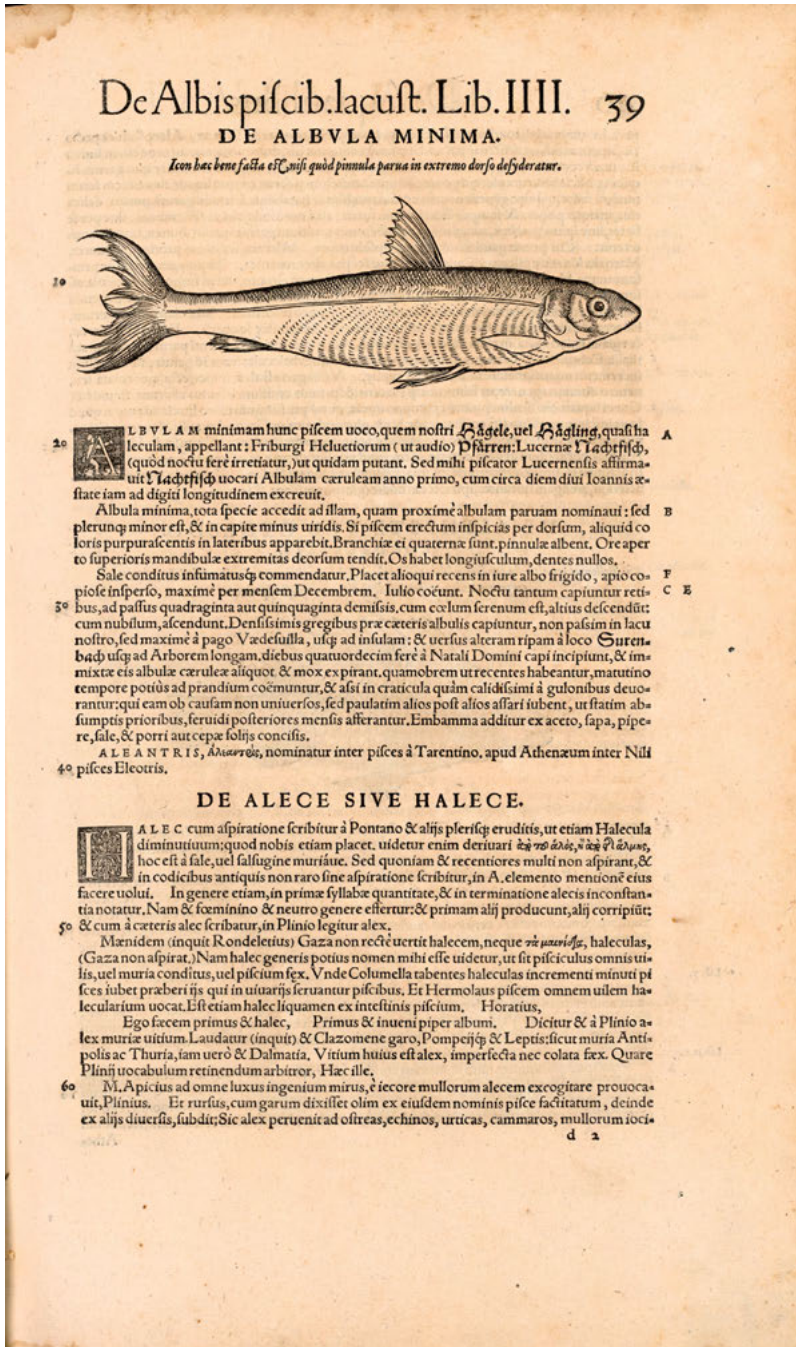


Fig. 3: The "Hägelin" or "heglingus". Conradi Gesneri medici Tigurini *Historiae animalium* liber III. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 39 (ZBZ, Alte Drucke und Rara, NNN 48).

## Describing rare species in relation to the well-known

The wider group of salmonids to which the “*albulae*” are connected, which Gessner calls *truttae* or *Forellen*, is, as the “*albulae*”, described as a whole. This description mentions that this group contains a wide range of species.<sup>31</sup> While the descriptions of the *Felchen* species consistently point out these are types of “*albulae*”, those species which do not belong to the subgroup are simply said to be types of *truttae*. Nine *truttae* species in total are discussed separately.<sup>32</sup> These include the four types of “*albulae*”, the salmon (*Salmo salar*), the trout<sup>33</sup> (*Salmo trutta*), the grayling (*Thymallus thymallus*), the arctic char (*Salvelinus alpinus*), the Danube salmon (*Hucho hucho*), and the Lake Garda trout (*Salmo carpio*). Of these species, the salmon and the trout are by far the most common and well-known. As these species are all similar looking, much information on physical characteristics provided in the descriptions of the common species also applies to the rarer species.

While in the context of each described species some shared characteristics are mentioned as an explanation why that particular species is linked to the group,<sup>34</sup> much of this information is not repeated. The descriptions of the rare species instead refer to the common species. Consequently, the descriptions of the salmon and the trout are much more extensive than those of the other *truttae*, including the “*albulae*”. These discuss the species’ physical appearance, behaviour, spawning, habitat and diet. On physical appearance the description of the salmon is the most extensive, quoting Rondelet’s *Libri de piscibus marinis* Gessner describes the trout as similar to the salmon in term of physical characteristics and behaviour.<sup>35</sup> The salmon is in turn described as having, among other characteristics, small scales, teeth and a broad tongue, pink flesh, a black and blue back, a lighter belly, and many spots of colouration.<sup>36</sup> The descriptions of the other species point out

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31 Gessner (1558), p. 1198: “*De Truttis Scripta Sequuntur Hoc Ordine. [...] Corollaria. I. (Huic tabella de Truttarum generis divisione praemittitur: ) De Trutta fl. & quadam de Truttis simpliciter vel in genere. II. De Salmarino. III. De Trutta lacustri. IIII. De Umblis. V. De alia specie Truttae fl. quam Germani Huch appellant.*” The text refers to a table which includes the “*albulae*”, which are presented as a subgroup.

32 Counting the fourth *Felchen* species added in the *Fischbuch*.

33 Figure 4.

34 Most often the adipose fin is mentioned. This is also mentioned as part of the description of the group. Gessner (1558), p. 1199: “*Id omnibus commune est, quod posteriorem dorsi pinnam parvam habent et subrotundam, pinguemque.*”

35 Gessner (1558), p. 1200: “*Truttas Salmones esse fluviatiles vel lacustres nemo est qui negare possit, si has cum Salmonibus marinis, qui flumina subeunt, dilligentius contulerit; et partes omnes tum internas tum externas vitam Moresque accuratius inspexerit. Sed ut Salmonum, ita Truttarum discrimina quaedam sunt, a corporis colore vel maculis, et a loci varietate sumpta.*”

36 Gessner (1558), p. 973: “*Piscis est squammosus [...] parvulas rubescentes maculas multas.*”

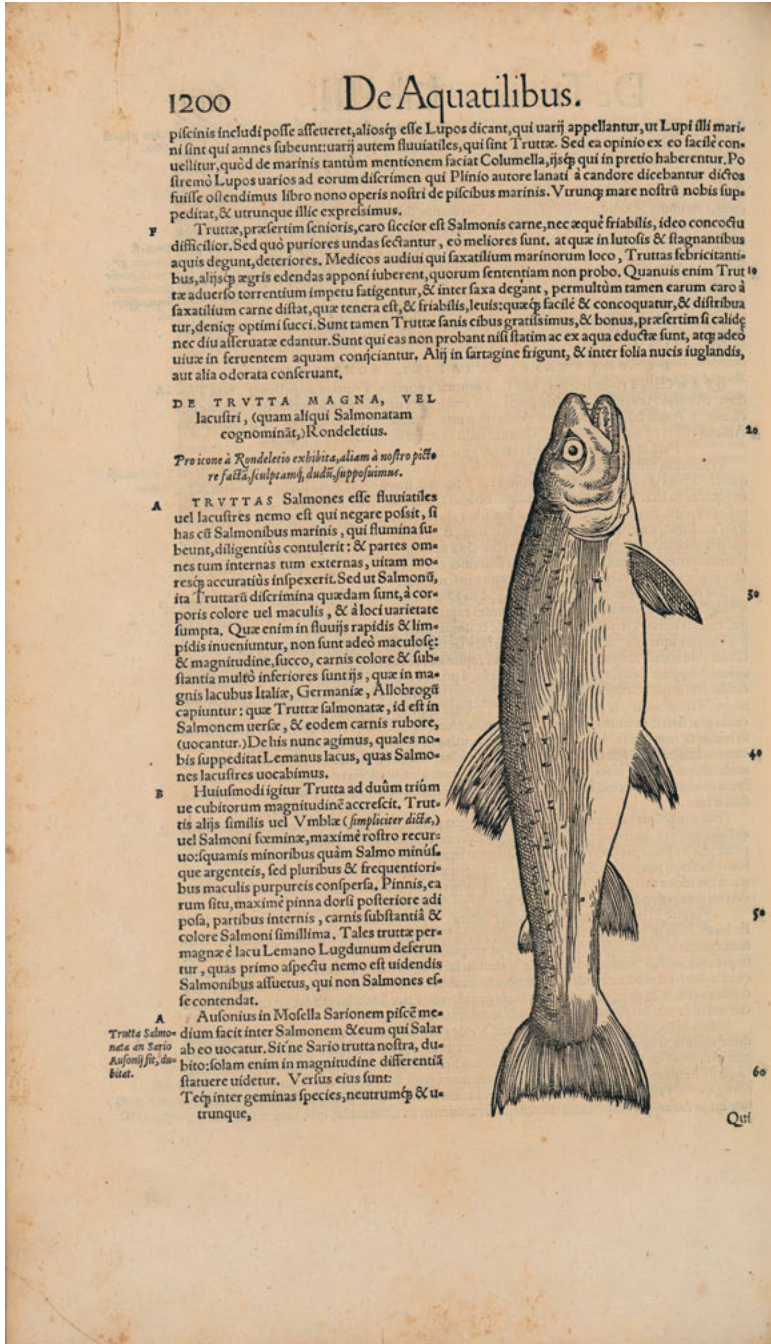


Fig. 4: The "Grundförlin" or *Trutta magna*. Conradi Gesneri medici Tigurini *Historiae animalium* liber III. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froshoverum, anno 1558, page 1200 (ZBZ, Alte Drucke und Rara, NNN 48).



## De Capitone. Lib. III.

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dio ventre infra: una à podice, color eorum rufus: ut & caudæ, in qua tamen extrema ad ceruleū inclinat. Bellonius pinnas duas in lateribus ei tribuit, ad branchias intelligo: ac rufus utrinque unā, duas rufus sub ventre, ego hæc uerba *ac rufus* abūdere dixerim, pinnas enim duas ad branchias habet, utrinque unam: ac rufus duas sub ventre, unam à podice: **¶** res ipsa ostendit, & Rondeletius quoque recte scripsit. Pinnae in dorso initium æquidistabat ab initio capitis, & initio caudæ. Squamæ splendide, albicantes, angulose, lætæ (unde squamæm Aufonius cognominauit, ab earum magnitudine) cute ultra medium obductæ, minimis uariante punctis. Oculi nigri, in circūitu aureoli, tempora subflaua, os rubicundum. Linea quædam à branchijs uerfus caudam per medium corpus leuiter apparebat. Latitudo inter utrinque oculum trium digitorum erat. Dentes latent in faucibus, in maxilla ferè femicirculari, superne leuiter aduncæ, ordine duplici, exterius quinti, interius bini. Cum maximus est, ulnæ mensuram æquare audio. Arifis in carne multis abundat: nec omni tamen tempore uel ætate puto: nec undiquaque, sed uerfus caudam præcipue.

Nostro quidem seculo piscinam nemo ferè habet nisi dulcem, & in ea dumtaxat squalos ac muges pisces, Varro. Squalus lacustris & fluuiatilis est, Gillius, & apud nos similiter: maior tamen in fluuiio nostro, ut aiunt, quàm lacu, in Rheno quoque magnus. Capiunt & in Lario lacu: in Constantiensi lacu nullus, neque inferiore neque superiore. Inuenio Cephalum, etiam inter Strymonis fluuii pisces nominatum à Bellonio: nec scio an de marino intelligat, mugiles enim Nilū subire Strabo auctor est. **¶** Squameus herbofus capite interlucet arenas, Aufonius. Ouidius etiam inter pisces degentes in herbofa arena squalum numerat, sed marinos, cephalum marinum **Cephalus** forte intelligens,) hoc uerfus: Et squalus, (addo, &c) tenui suffusus sanguine nullus. **¶** Gregatim natat. **¶** Carnem & pisces non attingit: sed scarabeis & quibusdam animalculis, quæ in aquæ superficie uiderit, saltu mordicus apprehensis pascitur: ut ineptè à quibusdam **(Hülseffer, id est, muritorius cognominetur, nō enim mures, sed mufcas captat, & cantharos. Vide in E. quibus inelatur.** **¶** Mense Maio parit: uel, ut quidam dicunt, Maio, ab uno latere; ab altero uerò postea, cum cerasa quæ amarella nostri uocant, iam matura sunt.

Hamo capiuntur, cui piscatores inferunt, uel gryllum campestrum, uel acinum uuæ: uel musce genus, quod piscatores nostri **Allemuggen** appellant, ea musca est magna, oblonga, nigricans: per hyemem in fluuijs latens, alia specie apparet, ut in Historia Insectorum dicemus. Cerebro etiam bubulo delectantur: cuius particulam subtiliter circa hamum piscatores quidam alligant.

**¶** Viscere præterea fartim congestus arifis, Nec duraturus post bina trihoria mensis, Aufonius de capitone. Squalus sane noster uilis est piscis, & cum mollis sit carne mox extra aquas flaccescit. Qui maior fuerit minus est mollis: ut hic etiam, sicut de barbo Aufonius scribit, in senectū præferendus uideatur. Commendantur apud nos Decembri potissimum. Scribunt aliqui per hyemem totam eos admitti mensis posse, & uere etiam usque ad initium Maii, æstate non probari. Placent & circa Octobris calendæ, quo tempore hæc dum scriberem, unum ouis grauidum reperi, magnus is & præpinguis erat, oua quoque sapiebant palato. Nec ullæ apparebant arifis, siue illæ non omni tempore, siue non omni ætate in eis reperiuntur. Mensura squali, qua minorem uenit in Bawaria non licet, septem uel octo mediocres uiri digitos implet. Caput in eo præferunt. Fluuiatilis lacustribus, tum faporis odorisque, tum salubritatis gratia, antetulerim. **¶** Allus plerumque magis laudatur, si elixari placeat, uino frigido imponendus est: & cum iam propè est ut satis coctus sit, butyro calido perfundendus. Sunt qui hunc piscem maufculum, in tres dissectum tomos, ad quadragesimale sciuntium reponant.

Capitonen recentiores aliqui uocant gobij fluuiatilis genus alterum, cui caput est grandius. **H. a.** **¶** Capito etiam dicitur de homine qui magnū caput habet, Ciceroni i. de Nat. & duri capitones, qui nunquam de sua sententia immutantur, apud Plautum in Persa.

CARABVS, uide in Locusta.

CARINVS, uide supra in Balagro.

CARIS Græcè, Latine Squilla est.

CARO marina à Trotila in libro Muliebrum capite uicifimonono, miscetur medicamentis **¶** to ad maculas oculorum.

DE CARPIONE BENACI.  
RONDELETIVS.

Fig. 5: The “Gardtförinen” or “Carpio Benaci”. Conradi Gesneri medici Tigurini Historiae animalium liber III. qui est de piscium & aquatiliū animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 217 (ZBZ, Alte Drucke und Rara, NNN 48).

these share these characteristics, except for certain small differences, which can help identify the species within the group.<sup>37</sup>

The description of the Lake Garda trout, here called “*Gardtförinen*” or “*Carpio Benaci*”,<sup>38</sup> for example states that the species has an adipose fin<sup>39</sup> and has small scales like the trout,<sup>40</sup> but also makes clear how this species can be told apart from it. To this end the description states this species is similar to the trout but is smaller, usually no bigger than a foot,<sup>41</sup> has a wider mouth and more protruding belly, and is limited to Lake Garda.<sup>42</sup> All of this, identifies it as the lake Garda trout (*Salmo carpio*).<sup>43</sup> In a similar manner the Danube salmon is described as similar to the trout but with different colouration,<sup>44</sup> the arctic char is described as similar to the trout but without spots of colouration on the body,<sup>45</sup> and, quoting Belon's *De aquatilibus*, the grayling is described as similar to the trout but among other things different because it has no teeth.<sup>46</sup> While in each case arguments for placing the discussed species in the *truttæ* group are presented, these are relatively limited, and the extensive list of physical characteristics presented in the descriptions of the salmon and the trout is not repeated. More attention is paid to those characteristics that make the species different from the trout and which therefore can aid identification of the species.

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37 This approach to description is visible throughout Gessner's ichthyological work. In Gessner's discussion of clupeids for example he discusses the common ones both separately and within his description of the herring, while the rarer are only described separately.

38 Gessner (1558), p. 217; Gessner (1560), p. 343; Gessner (1563), f. 189 r. Figure 5. The woodcut is based on a drawing from Gessner's collection. Platter, University Library Amsterdam Ms C III 22, f. 11 (16th century).

39 Gessner (1558), p. 218: “*Pinnulam dorsi posteriorem adiposam habet, que Salmonum et Truttarum nota est.*”

40 Gessner (1558), p. 218: “*squamarum parvitate Truttis similis est.*”

41 Gessner (1558), p. 218: “*Est igitur Carpio piscis pedali magnitudine*” Approximately 30 centimetres. A foot, or Schuch, was in Zürich approximately 301 mm. Niemann (1830), p. 286.

42 Gessner (1558), page 218 “*Hoc tantum a truttis differ, quod ventre sit paulo prominentiore et rostro longiore.*”

43 The woodcut is based on a drawing from Gessner's collection and was newly introduced by Gessner. Platter (University Library Amsterdam, Ms III C 22), f. 11.

44 Gessner (1558), p. 1213. Gessner received a description and depiction of this species from Achilles Pirmin Gasser. The fact that he fails to mention that these fish frequently reach 150 cm in length suggests he never saw a specimen himself.

45 Gessner (1558), p. 1212: “*quodque maculis seu punctis carent.*”

46 Gessner (1558), p. 1172: “*Truttacei generis est [...] dentibus caret.*”

## Problems regarding the identification of species

While the identification of the various described species is thus aided by focussing on the differences between them, in particular within this group of salmonids problems occur which can obstruct a correct identification. This includes varying physical characteristics within the same species, which are carefully explained. In many cases Gessner's descriptions of such phenomena form a distinct improvement upon the descriptions of his contemporaries. In the context of the "*albulae*" Gessner mentions an "*Albula parva*"<sup>47</sup> which the text suggests could be a juvenile specimen that is under three years old.<sup>48</sup> A depiction is included of a fish which is very similar to the one depicted with the description of the adult state but is smaller.<sup>49</sup> For the other *truttiae* the differences between juveniles and adult specimens are explained in the description of the species in which these are the greatest, the salmon. This discusses the juvenile state under a separate heading and includes depictions showing both the adult and the juvenile state.<sup>50</sup> As, the description of the juvenile salmon points out, physical differences between juvenile specimens and adults sometimes led to confusion. In this case the juveniles are mistaken for trout.<sup>51</sup> While Rondelet mentions that juvenile salmon are physically different than adult specimens,<sup>52</sup> and while Mangolt mentions that juvenile *Felchen* look somewhat different

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47 Gessner (1558), p. 38; Gessner (1560a), p. 342; Gessner (1562a), f. 188v. Figure 6. The illustration is based on a drawing from Gessner's collection. Platter (University Library Amsterdam, Ms III C 22), f. 28. Mangolt had also described the juvenile *Felchen* separately. Mangolt (1557), p. 41: *Von Kirchlin*.

48 Gessner (1558), p. 38; Gessner (1560a), p. 342; Gessner (1562a), f. 188v. Gessner's description indicates that while some point out there are differences between these *Felchen* and others, others claim these are juvenile fish, under three years old. "*Sunt qui putant albulam nostram non sui generis piscem esse, sed albulam sive bezolam caeruleam secundo tertioe suae aetatis anno ita vocarit; quibus piscatores nostri contradicunt, quod caeruleos observarint secundo etiam ac tertio anno forma coloresque a genere albularum (de quibus hic loquimur) differre.*" Because the juveniles of many fish species are physically different, this often leads to confusion and juveniles are often mistaken for different species. Gessner does not provide a definite answer here.

49 Figure 6.

50 Figures 7, 8 and 9. The depiction illustrating the juvenile state, shows a juvenile near the end of its transition to a marine environment. This was made after an original drawing that was part of Gessner's collection. Platter (University Library Amsterdam, Ms III C 22), f. 30. It is not known who created the drawing or how it came in Gessner's possession. However it is remarkably similar in style to the drawing of the trout mentioned above, so much so one would expect both drawings to have been produced by the same artist.

51 Gessner (1558), p. 971: "*Suntque Truttis adeo similes, ut vix a peritis internoscantur, nisi propius inspexerint. Sed aliquid esse quo discernantur, capite de Truttis docebimus.*"

52 Rondelet (1554), p. 169.

38

## De Aquatilibus.

suis & loco manentem reperunt: quàm qui superficiem uersus efferunt, ubi & parcius inueniunt, & cum labore insequuntur. Alij tamen buzum quoq; altius efferri mihi retulerunt.

*Forfand Pala.* Forfan & in Lemano Ferra uel Pala dictus piscis, quanquam cubitali magnitudine, ut Rondeletius scribit, non alius quàm buzus noster est, & ipse inter albulas maximus lautissimusq; (nisi nobilem excipias,) pro lacuum diuersitate maior aut minor. Pala nomen accedit ad Germanicum *Waal*, sic enim albulæ genus quoddam in Aconio uocitant, Ferra ad Germanicum *Selph*. Minimum quidem albularum genus Friburgi in Heluetia *Pferren* uocari audio.

DE ALBULA PARUA, VEL SIMPLICITER  
DICTA IN TIGVRINO LACV.

**A** **Q**UASI omnes lacustres pisces albos, communi nomine Albulas nominare nobis uisum sit: hunc tamen priuatim Tigurini mei albulam indigentant, eam Albele, quare nos etiam uel simpliciter sic uocabimus, uel parue discrimine adijciemus. De minima quidem proxime dicitur, Sigismundus Gelenius aliquando ad me scripsit albulam (sic appellans, haud scio an diuersum piscem) Illyricè dicti bilya. Sunt qui putant albulam nostram non sui generis piscem esse, sed albulam siue bezolam cæruleam secundo tertioque suæ ætatis anno ita uocari quibus piscatores nostri contradicunt: quod cæruleos obseruarint secundo etiam ac tertio anno forma coloreq; à genere albularum (de quibus hic loquimur) differre.

Nondum aduete, ut bezolæ quoque, communi nomine uulgo *Wigling* dicuntur. Alius est piscis Albur in lacu Lario: & qui apud Sabaudos Able dicitur, Alburnum Aufonij Gallis able uocari, pisciculum minimum, de quo supra scripsimus, Rondeletius & Bellonius auctores sunt.

**B** Cognatus est hic piscis cæteris lacustribus albis. Nam & species, & sapor serè omnium non dissimilis est. Albulæ magis quàm Bezolæ albicat, cauda tamen & reliquæ pinnae, præter eas quæ iuxta branchias sunt, nigricant in extremitatibus. Dorsum color glaucus: alicubi tamen purpurei quiddam & cærulei mixtum uidetur. Caput ex glauco cæruleum. Inter caput & dorsum color uiridis, ceu gemma relucet. Branchiæ ei quaternæ. Hyeme aliquando memini uidere me hunc piscem squamis per latera exasperatum, eminentibus per singulas squamas ueluti tuberculis. Aiebant hoc iudicium esse recentium & uituarum. Capiuntur Albulæ in summa parte Tigurini lacus, iuxta locum quem *Bühberg* uocant, diebus serè quatuordecim post diem diui Martini: & ad oppidum Rapperswillam circa ipsum diui Martini diem. A partu in lacum nostrum descendunt (sed non tam procul ut cæteræ albulæ) usque ad uer: deinde rursus ascendunt rota æstate usque ad diui Martini diem. Capiuntur etiam in Gryphio agri Tigurini, multò maiores quàm in nostro: & in Haluuenti Bernensis agri.

**C** Albulæ Augusto & Septembri mensibus præcipue laudantur, quod sicutiores eo tempore solidioresq; sunt, postea enim pariunt, & mollior earum caro fit: & succus in forturam consumitur.



DE ALBULA

Fig. 6: The "Albula parua". Conradi Gesneri medici Tigurini *Historiae animalium liber III*, qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 38 (ZBZ, Alte Drucke und Rara, NNN 48).



## De Salmone. Lib. III. 971

in ea faporis gratia, & succi bonitate alijs sunt inferiores, eam, opinor, ob causam quod illic mari propiores sunt.

Pisces sunt carni ueri, in mari latent, ob id rariùs capiuntur.  
Horum felle ad oclorum suffusiones & maculas, purulentasq; aures rectè nos uti posse arbitror, eorundem pinguitudine ad aurium dolores. Carne salita & uita ad ulcera capitis manantia, C B  
G.

## DE PARVO SALMONE, RONDELETIVS.

*Eicon hæc nostra est, Rondeletius nullam dederat.*

10



PARVOS Salmones qui pedem unum uix superant, Galli & Aquitani Tacones appellant: fincip Truttis adeo similes, ut uix à peritis interoscantur, nisi propius inspexerint. Sed aliquid esse quo differantur, capite de Truttis docebimus. Cùm igitur parui isti Salmones maioribus omnino sint similes, dempta sola magnitudine; & in ijs solum locis capiuntur, in quibus Salmones, non possunt non existimare Taconem, Salmone esse qui in fluminibus non in mari nascatur: quorum aqua cùm frigidior sit, & ad procreandum minus idonea quam marina, breuioribus igitur Salmones. Adde quod in proprio & natali solo felicitius omnia quam in alieno. Id in Lampetris cernitur, quæ in fluuijs genitæ semper marinis sunt prouentur, quam in alieno magnitudinem accrescunt. Quare aut Tacones necesse est esse Salmones in fluuijs natos, aut recens in mari editos, qui patres seculi sint. certum enim est Salmones in mari parere: Tacones autem uel minores adhuc esse quam ut pariant, uel imperfectos esse Salmones, & ueluti abortiu editos. id indicat quod in ijs nunquam uel oua uel femina, quod lac uulgus appellat, reperias. In Garumna & Ligeri frequentes & optimi habentur.

DE SALMONE VEL SVLMONE,  
Bellonius.

Salmone cetaceum piscem dicere poteris, si quidem ad eius solam magnitudinè aduertas: ut plurimum enim (pro enim, legendum puro dauim uel ruium. Cardanus non rectè legit, plurimum cubitorum) cubitorum longitudinè, crurisq; crassitudinè æquat: squamis tamen est pro corporis ratione admodum tenuibus: quæ maculis per totam cutem conperse, orbiculos rufos ac luteos referunt. Minor piscè hunc uulgo tantopere cognitum Græco nomine carere. Paruam in medio tergore pinnullam habet, & ab ano sub cauda rursus aliam carneam ac pinguem. Caudæ autem pinna subrotunda est: porrò quatuor aliarum pinnullarū, quas sub uentre gerit, duæ sub branchijs positæ sunt, alie uentri incumbunt, ei oppositæ, quam in dorso sitam esse diximus. (Maiores quoq; in dorso pinna sequitur alia minor, adiposa. Rondelet.) Lineam utriusq; in lateribus rectâ à branchijs ad caudâ deductâ habet. Pinnullas luteis & rubris maculis, ut reliquæ corpus distinctas. Dentium illi (preter aliorum fluuiatium morem) sunt quatuor ordines in palato, ut serpenti Cerafæ. Lingua quoq; dentibus hamatis exasperata: exterosq; ostendit maxillæ inferioris dentes, plures quidem quam superioris: branchias ad radices linguæ utriusq; quaternas: stomachum in longitudinem protentum, pro tanto corpore ualde angustum: hepatis unicum tantum lobum pallidum, stomacho adsidentem, & ad sinistram inclinatum, de quo felle uescula ex uiridi in nigrum abies, dependet: lienem atrum ueluti sanguine suffusum, apophyses in pyloro penè innumeras.

Magnus est in Sequana ac Ligeris olijis, in quibus à mari exiliens cū Alois repurgat, ac de Magnitudine. Vbi. C F  
licitor sit. Maior ad Tamelium Britannicū, qui Londinum alluit: sed illi Salmone in longi per medium, nos cōmodiùs in transeuersum dissecamus atq; apparamus. Salitum quoq; oleo ace to conperium gratissimo sapore comedimus. Recens per hyemem ac uerna icuinia faccaro ac cinamomo conditus & caryophyllo pertusus, ditiorum mentas honorare solet.

Est & alius prægrandis Salmo (fœminam esse autumant) quem uulgus Gallicum ab eius ore prægradi Beccard uocare solet. Alij à ferendis (partendis) ouis Bortiere. Differt is à mare Salmone, quod labrum inferius in hami modum aduncum habet. In superiore enim labro foramen est ad palatum tendens, in quod hamus maxillæ inferioris se recipit, pyxidatimque in tubi modum insinuat. Crebrioribus quam Sulmo mas, ijsq; subrubris ac rulis orbiculis in cute uariatur, atque in prægrandis modum multis coloribus fuggillatur. Linguam habet truttarum more albam, Salmone fœminæ

Fig. 7: The "Selmling" or "Salmo parvus". Conradi Gesneri medici Tigurini Historiæ animalium liber III. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 971 (ZBZ, Alte Drucke und Rara, NNN 48).

than their adult counterparts,<sup>53</sup> neither author described these physical differences in detail or offered an illustration showing a juvenile specimen.<sup>54</sup>

## Male and female specimens

Also in the description of the salmon, several issues relating to sexual dimorphism and spawning which can complicate identification are addressed. The adult state of the salmon is described both outside of spawning, in spring and summer until S. Jacob's day on the 25<sup>th</sup> of July<sup>55</sup> when Gessner calls it *Salm*, and during spawning, when he calls it *Lachs*.<sup>56</sup> The description includes depictions<sup>57</sup> of a male and female specimen during spawning.<sup>58</sup> In many species male and female specimens are physically different, in ways that vary from species to species. Consequently, in his depiction of many species Gessner takes care to clearly show this sexual dimorphism. In the case of the salmon however, identification is further complicated by skeletal changes which take place in male specimens during spawning. The text offers a description of this phenomenon. The description of the trout and the arctic char, which also undergo these changes, do not repeat this information but refer to the description of the salmon.<sup>59</sup>

53 Mangolt (1557), p. 41: “Von Kirchlin. Diß sind weiß Schüpfisch und geformiert wie die Gangfisch, habend groß beüch, werend als groß als halb Felchen.”

54 Gessner added a subscript to the woodcut reading: “*eicon haec nostra est, Rondeletius nullam dederat*”. Indeed, although Guillaume Rondelet in his 1554 *Libri de piscibus marinis* had pointed out that juvenile and adult salmon differ significantly in physical appearance, he had not included an illustration of a juvenile salmon.

55 Taking into account the negative difference between the Gregorian and Julian calendar this corresponds with August 5<sup>th</sup>.

56 Gessner (1558), p. 972: “*Ille qui Lachse vocatur [...] in foemina perparum.*”

57 Figures 8 and 9. In the *Nomenclator* a superscript above these depictions states one represents a *Salm* and the other a *Lachs*, however a close look reveals that rather than specimens inside and outside of spawning these illustrations depict a male and female during spawning. Gessner (1560a), p. 327. The *Salm* / *Lachs* division does not only differentiate between specimens in- and outside of spawning, but in relation to this also to habitat, as the adult specimen leave their marine environment and migrate upstream to spawn, after which those who survive return once again to the marine environment.

58 This focus on the physical differences between male and female specimens, amongst other things in relation to the delineation of species is another recurring theme in Gessner's species' description, not only in his ichthyological work. For example, where Pliny and Aristotle had interpreted the male and female lion as two separate species Gessner described both sexes as part of a single species. Enenkel (2014a), p. 57–148.

59 Gessner (1558), p. 1200, B; Gessner (1560a), p. 342: “*sub autumnum in flumina ascendit, ut pariat, et rostro tum incurvato, sicut Salmones, nomen quoque mutat apud Germanos*”. Gessner (1558), p. 1201: “*Est igitur hic piscis Salmonibus et Truttis [...] similis; rostro recurve.*”

## De Salmone. Lib. III. 969

SALAR piscis ab Aufonio dictus, sine dubitatione is est, quem uulgò Truttam appellamus, Gillius. Cuius sententiam Ge. Agricola quoque comprobauit, nos plura de Truta pisce, quæ Germani *ein Fosen* uel *Söime* nominant, infra in T. elemento. ¶ Carolus Figulus in libello suo de piscibus ab Aufonio nominatis: Thedonem (inquit) opinor esse piscem quem uulgò Trutā nominant, Germani uerò & Galli Forellam (*Gallus ubiq; uisitatius puto nomen Trutter*): eundemq; Salarē & Farionem alijs nominibus dici, Confirmari hoc Aufonij ueribus potest, qui sunt: Purpureisq; Salar stellatus tergora guttis, Et nullo spina nociturus acumine Thedo. Et paulò infra de Farione: Tēq; inter geminas species, neutrumq; & utrunq;. Qui necdum Salmo, nec iam Salar, ambiguisq; Amborum medio Fario (*alijs, Sario*) intercepte sub æuo. Audis hic Thedonem esse paruulam & adhuc teneram Forellam; quæ postquā fuerit grandiuscula, nomen suum amittit, & Salar uocatur. Audis hinc etiam ab Aufonio Farionem dici medium inter Salarem & Salmonem, atq; Farionem ab Aufonio describi in hunc modū: Fario est aduultior Forella, Salar maior, & Salmonis minor: hoc est, quæ iam desijt esse salar, & quæ nondum est salmo, (mare autē ingressa Salmonis formam assumit,) Hæc ille. Ego Thedonem profus diuersum esse arbitror: (Vide supra in Corollario de capitone fl. A.) Farionem autem ab Aufonio existimatū quidem à Salmone ætate tantum differre, esse Forellam uulgò dictum piscem, Salmoni quidem non dissimilem, sui tamen generis à Salmonibus diuersum. ¶ Paulus Iouius, & eum secutus Io. Langius medicus in epistolis suis Carpionem Benaci, Salarē Aufonij esse putat, sed cum è Salarē Salmo fiat,

20 carpio autem ille, qui Trutarum generis est, idem & re & nomine piscis maneat, quomodo erit Salar Aufonij: Hic sanè nihil aliud est quàm paruulus Salmo, *ein Schmling* Germanis.

SALENA inter pisces Larij lacus à Benedicto Iouio nominatur, hoc uersu: Scardula & Incobia ex Pigeis, & Plota, Salena. Videtur autē piscis esse qui captus gregatim: sicut apud nos leucisci species, quam Galli

30 Vendosā uocāt, nostri *Lauc!* / *Laugden*.

DE SALMONE.  
RONDELETIVS.

Pro una Rondeletij icone (quæ squamas nimis magnas habere mihi uidetur) Ictus nostras posuimus: uenam A. Salmonis ante partum, hoc est uerni & estiuiciteram B. autumnalis & hyberni, sub partu & à partu, qui rostro recuruo & maculis pluribus facit dignoscitur.

40 SALMONVM differētiæ aliquot diuersa etiam nomina ex uaria ætatis inclinatione imposita esse dicuntur: maximum enim & qui iam senit, Salmonem propriè uocant, hoc minorè quicq; medietate ætatis Saronem, siue ut alij legunt, farionem ex Aufonio in Mosella, cuius uersus citauimus quum in lacustribus de Trutta loqueremur: (*nos paulò antè in Salare.*)

50 Galli differētiās duas agnoscent, magnos, Salmones uocant: paruos, Tacons. Præterea marem à fœmina distinguunt: hanc enim ob rostrum magis aduncum, hami modo, Becard appellant. Salmo in Oceano tantum nascitur, qua de causa fluuios tantum eos subit qui in Oceanum influūt, fallunturq; ij qui in Rhodano capi existimant, Plinius Salmonē nuncupauit. Græcis incognitū fuisse, & ideo Græco nomine carere nihil mirū, cum Græci ueteres in Oceanum non penetrarint. Galli hodie idem nomē retinent: item Germani, si recens sit piscis: sin salitus, mutato nomine



**Fig. 8:** The female salmon. Conradi Gesneri medici Tigurini *Historiae animalium liber IIII. qui est de piscium & aquatiliū animantium natura.* [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 969 (ZBZ, Alte Drucke und Rara, NNN 48).



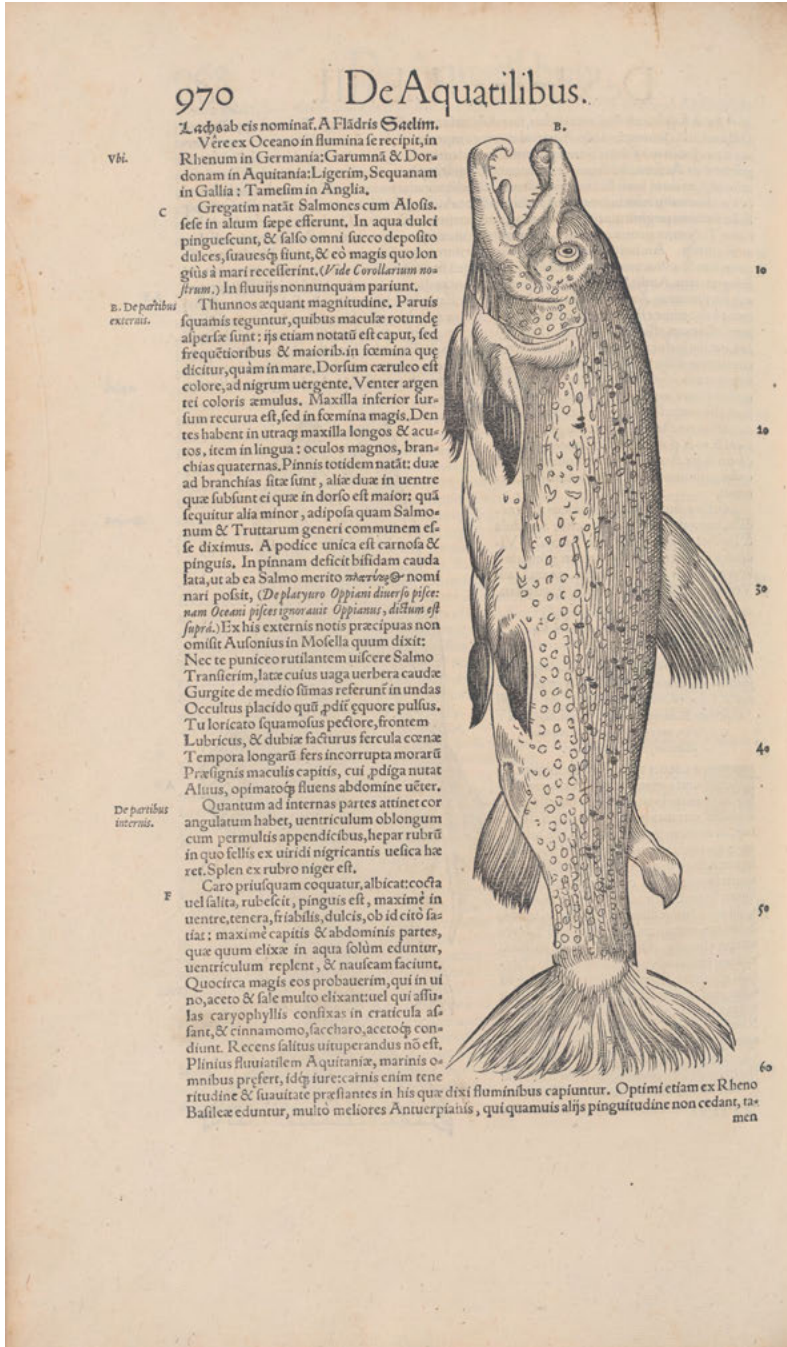


Fig. 9: The male salmon. Conradi Gesneri medici Tigurini *Historiae animalium liber III. qui est de piscium & aquatiliu animantium natura*. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 970 (ZBZ, Alte Drucke und Rara, NNN 48).

Gessner's description of this phenomenon is a distinct improvement on descriptions offered by one of his contemporaries. The described changes include the fact that during spawning the males develop a hooked lower jaw.<sup>60</sup> In his *De aquatilibus* (1553) and his *La nature et diversité des poissons* (1555) Pierre Belon presented an unlikely portrait of a female specimen with hooked lower jaw. Although this may have been a composite drawing based on the study of both male and female specimens,<sup>61</sup> the text also describes the female as developing the hooked jaw.<sup>62</sup> This misinformation also appears in Rondelet's *L'Histoire entière des poissons*,<sup>63</sup> but not in his *Libri de piscibus marinis*.<sup>64</sup> Gessner's depiction of a male specimen clearly shows the hooked lower jaw,<sup>65</sup> while his depiction of a female specimen<sup>66</sup> is easily identified as such due to the prominently depicted ovum tube. Much like the curled jaw of the males, this is only clearly visible at the time of spawning. Gessner indicates he obtained this information from fishermen.<sup>67</sup> The illustrations included by Belon and Rondelet did not show the ovum tube. In fact, Gessner appears to have been the first to clearly describe the spawning process and depict the related sexual dimorphism of the salmon.

## Physical appearance

Another issue complicating identification, which occurs in the arctic char, is described in a similarly clear manner. Arctic char can develop into different phenotypes, this term referring to the physical appearance of specimens distinct from their genetic make-up. Three physically radically different types of arctic char are described by Gessner. Separate descriptions and depictions are included for each type, although it is made clear that these refer to the same species. The first of these is

<sup>60</sup> Female specimens of *Salmo salar* also undergo skeletal alterations that coincide with spawning but only males develop the hooked jaw. Kacem, Meunier, and Baglinière (1998), pp. 1096–1109.

<sup>61</sup> Another possibility which has sometimes been suggested is that Belon studied a deformed specimen. Gudger (1936), pp. 252–261.

<sup>62</sup> Belon (1553a), p. 172: “Le saulmon femelle, que les Francois, a cause de ses oeufs, nomment une portier, ou de son bec faict déstrange facon un Beccard, est différent au masle, pource qu'on luy voit comme un crouchet en la maschoire d'embas, qui s'encre en celle de dessus comme s'emboistant en maniere de haqueboutte.”

<sup>63</sup> Rondelet (1558), p. 123: “Davantage ilz sont difference entre le masle é la femelle, laquelle ilz appellent Beccard a cause quell'ha le bec plus crochu que les masles.”

<sup>64</sup> Rondelet (1554), p. 167: “Preaterea marem a foemina distingunt: Hanc enim ob rostrum magis adundum, hami modo, Beccard appellant.”

<sup>65</sup> This illustration appears to be original, no trace of it has been found in any earlier publication. The drawing upon which this was based has most likely not been preserved.

<sup>66</sup> The source of this illustration is unknown.

<sup>67</sup> Gessner (1558), p. 972: “Nostris piscatores in mare tantum recuruari aiunt insigniter, in foemina perparum.”



therefore, that Gessner was able to obtain information on this species from fishermen. In an overview of salmonid species included in *De Piscium*<sup>72</sup> the “*Umbla*” is listed on the same level as other species and then divided into the *minor*, *maior* and *maxima*, as if these are subspecies.

In his *Libri de piscibus marinis* Rondelet also describes an “*umbla*” and an “*umbla altera*”,<sup>73</sup> on which Gessner based his descriptions of the “*Umbla maior*” and “*Umbla maxima*”. Here Rondelet explains that the only difference between the two is that the latter is larger, stronger, and superior.<sup>74</sup> It seems therefore that Rondelet also connected these two species and perhaps even interpreted them as different types of the same species, however he does not make this explicit. Gessner’s explicit presentation of these phenotypes as the same species is a distinct improvement. The fact that Gessner could add a third type indicates he obtained information from a well-informed expert or studied this variety himself. Recently populations have been recorded in the same environments where Gessner reports they could be found, in Lake Geneva, Lake Neuchatel, Lake Constance, and Lake Lucerne.<sup>75</sup>

## Depiction of species in relation to their organisation

In the context of such varying physical appearance within one species, the included illustrations add to a clear explanation of such issues. Also in other ways, these reflect the focus on the identification of these species which is present in the descriptions. As we have seen the description of the “*albulae*” presents several arguments why these form a subgroup within the wider group of the *truttae*. Of the characteristics listed here one appears to have been the most important. In a schematic overview of salmonid species in the *Historia animalium* and in the *Nomenclator* Gessner presents the “*albulae*” at the bottom as “*Truttis cognati, sed absque dentibus*”;<sup>76</sup> relatives of the *Forellen* without teeth. As we can see, grayling, or *Thymallus*, is given the same position.

The topic of teeth in fish was discussed extensively by Pliny as well as by Rondelet. While they do not organise species into fish that have teeth and fish that do not, such a division is applied in the work of later authors such as John Ray.<sup>77</sup> The presence and the location of teeth vary greatly among fishes, making this a useful tool to identify species and distinguish between them. The importance Gessner

<sup>72</sup> Gessner (1558), p. 1203.

<sup>73</sup> Rondelet (1554), p. 160.

<sup>74</sup> Rondelet (1554), p. 160–161: “[...] *sed discriminis [...] fortasse ob magnitudinem, praestantiam & robur.*”

<sup>75</sup> Quartier (1951), pp. 631–637. Dörfel (1974), pp. 80–105.

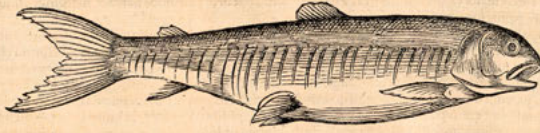
<sup>76</sup> Gessner (1560a), p. 311. While in fact these species do have teeth these are minuscule, making this indeed a useful characteristic to distinguish these species from other salmonids.

<sup>77</sup> Ray (1713).



1212

## De Aquatilibus.



- A** **V**MBLA vulgò vocatur piscis in Lemano lacu, à quibusdam literatis vulgi appellationem sequentibus, umbilicus, sed umbla fortè dicta est, quasi umbra, habere enim eum aliquam similitudinem cum umbra fluitatili puto, (Bellonius scribit Vmbræ fl. iconem idcirco se non appotuisse, quòd ad Vmblam proximè accedat,) & utrunq; truttarum generi cognatum esse, à truttarum enim propriè dictis differunt mollitiè & substantia carnis; & quòd lapillos in cerebro habent; quòd maculis seu punctis carent; fortè & alijs notis, si quis accuratè obseruet. A colore quidem rubicundo, circa ventrem præsertim, nomen eis indiderunt nostri *Xôtele*: in lacu circa Bielam *Xottele* uocant; (sed alius est *Xorrele* uel *Xorrene* dictus à nostris, quem nos Rutilum nominamus elemento R.) in Suecia uerò & circa Augustam *Xôtele* piscem alium fluitatilem, non la culstem uocant, & ipsum truttis affinem, de quo proximè scribemus. ¶ Est autem Vmbla alia maior, alia minor. ¶ Maior *Xotte* nominatur circa Bielam *Xotte*; à Sabaudis Ronte: circa Le. manum uerò Vmble. Rondeletius Vmblam uocauit, uel Salmonem Lemani lacus, Sed à salmo num quam truttarum natura longius abest. In Lucernensi lacu species duæ sunt; minor, quæ *Xôtele* diminutiuo nomine priuatim dicitur; & Sabaudicè circa Bielam Ronson, uel Bondelle; prius nomen à colore factum est, alterum fortè à bonitate: & maior. Est autem umbla maior piscis dentatus, tres aut quatuor dodrantes longus, uentre rubicundo, cætera salmoni aut truttæ similibus. Vescitur pisciculis. In Lucernensi lacu brachij ferè longitudine excrescit, magis albicatq; minor, debilis & infirmus piscis, nam si uel parum lædatur, aut morfu ab alijs piscibus faucietur, mox ueluti moribundus supernat. Est etiam lacus in Tuginorū Helueticorum ditone, quem *Zegeresee* nominant, profundissimus, in quo montes & recessus quidam sunt, ubi pisces latere possunt, in eo quoq; Vmblæ maiores inueniuntur. Genus quidem illud quod Vmblam eque stem à Sabaudis ad Lemannum Rondeletius uocari ait, non agnosco; neq; in lacubus nostris reperiri puto. Germanicè circumscribi potest, *ein andere Xooten art*. ¶ Vmblas nuper quidã à colore uulgo à nonnullis rubeculos appellari scripsit; quod ego nomen non approbo. ¶ Piscis qui in lacu Bauriæ *Zimmersee*, uocatur Germanicè *ein Pingling*, non alius quam Vmbla minor mihi uidetur, conferunt enim salmoni paruo; & à dorso usq; ad media latera coloris lutei esse aiunt adeò tenerum, ut statim extra aquam expiret; nec in alio ullo eius regionis lacu inueniri.
- B** Ad hoc segmentum pertinentia quædam in A. prædicta sunt. In nostro lacu, (& similiter Acronio, in quo abundat circa Bodman & Argen; minor tantum umbla (in Lucernensi & minor & maior) capitur; dodrantis plerumq; aut breuior, pedem raro excedit; aut si amplius increscat, uidet enim aliquando palmos quinque longum, Octobri mense in lacu nostro captum, corpore laetissimo, maximi se quadrachma ferè uaneunt, sed rarissimi nunquam tamen umblæ maioris magnitudinem attingit. Ventre turgidulo aliquando spectatur, propter uescicam nimium inflatã, est autem uescica ei oblonga, ut Albulis, non distincta per medium, Is quem olim descripsi, huiusmodi erat. Dorsum totum cum dimidia laterum parte subroseum; inferiora latera albicabant, uenter albusidem erat, caudæ color idem qui dorfi, pinnulam mollem & paruum, ut truttæ, dorso extremo gerit. Maxillis est dentatis, spinas etiam ceu dentes in lingua habet. Pinnæ omnes partim subalbent, partim crocei coloris sunt. Branchiæ quaternæ. Lapillos in cerebro habet. Mares uentre, pinnis & cauda magis rubent, femine candidant, eadem capite superius & dorso magis uident. ¶ Vmbla minori nostræ cognatus uidetur Eperlanus Oceani piscis, figura, magnitudine, colore, pinnis, dentibus, mollitiè & suauitate carnis, lapillis in cerebro. Est etiam, Bellonio teste, Eperlanus oris rictu amplo, dentibus ut umbla circumallato; ita ut Germanicè nominari possit, *ein Weerrôtele*. Icon quoq; eperlani similiter umblæ lacustris pingitur, hoc tantum in interese, quòd in Eperlano pinnæ binæ uentris medijs, pinnæ dorfi mediæ & regione uidentur respondere; in Vmbla Bellonij posteriores sunt, Rondeletij non item, sed illi umblam maiorem pingunt, nos Eperlanum comparamus minori.
- C** Vt truttas & alios quosdam pisces, sic & Vmblas Lemani uulgo alicubi auro uesci putat. Vt de supra in Thymallo c. ¶ Pariunt umblæ minores nostræ circa sancti Galli diem, ¶ Vmblæ maiores oua multa, alba & grandia, ut salmones gerunt: & minores similiter, multo quidem quam pro sua magnitudine maiora solidaque. Memini etiam Ianuarij quinto adhuc oua in eis reperisse.
- D** Mustelæ lacustres (Botatrilias Itali uocant) cum aliorum piscium sobolem, tum præcipue umblarum persequuntur.

Vmbæ

Fig. 11: The "umbla minor", male specimen. Conradi Gesneri medici Tigurini Historiæ animalium liber IIII. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froshoverum, anno 1558, page 1212 (ZBZ, Alte Drucke und Rara, NNN 48).

## De Truttis. Lib. III. 1211

Truttis maiores auditimus in Larij ripis lascivo excurfus extremos harenæ margines aliquã do iulsi passus longitudine profulcasse, loutius.

Quod ad lineas & hamos, quibus trutte in lacu capiuntur, lex quædam inter piscatorias no-  
stras est, quæ lineas in altum demitti prohibet. ¶ Trutta certo tempore, ut in c. præscriptum est,  
& lacubus in fluuios ascendens, (ex Acronio præsertim in Rhenum,) capitur micis fagenis: quæ  
in angulis riparum arte factis collocantur. nam cum per Rhenum rapidissimum flumen ascen-  
dunt, quærunt diuerticulum aliquod quietius, ubi respirent, quare piscatores ad ripam id arte fa-  
ciunt, insigunt enim palos aliquot ex alno, & spacia lapidibus explent, in huius ualli (aut ueluti  
promontorii) quietiore loco fagenam pandunt, tantam ut longitudine non excedat ipsum uallũ  
lapidum. Sagenæ adhærent ligella supernatantia, quæ statim ut irretitus est piscis, deprimuntur  
uel demerguntur infra aquam parum: unde constat piscem esse captum.

Trutte lacustris, omnium delicatissimi pisces iudicantur à nostris, caro eis solida, rubicunda,  
& boni faporis est: & quæ ad carponis Benaci naturam accedat, ea tamen aliquando præ pingue lectius.  
dine non nihil fastidiosj mouet, ut & salmonum: quam obrem modicè sumenda est, opfophagi qui-  
dam salmoni etiã præferunt, libra apud nos (quæ octo decim unciarum est) dimidiã drachmã  
plerumq; uenditur. Qui delicias quærunt, pinnas earum, (sicut & in salmonibus,) & uentriculũ,  
seu intestinum superius præcipue appetunt. Omnium qui daleibus in aquis generantur hic pi-  
scis longè nobilissimus æquali cunctiarum gentium iudicio censetur: loutius, simpliciter quidem  
de trutta, uidetur autem de lacustris præcipue sentire. Et quidem omni alio (inquit idem) uel ma-  
riño etiã pisce lapidiõr, præsertim si Maio mense, & in Breſciæ torrentis ostio capiatur, mortua  
paucissimis horis summam illam faporis gratiam amittit: quoniam ob pinguem illam teneritudi-  
nem quã ocysimè computrescit, Soleo ego plerumq; mirari quosdam, qui, ut sapietiores uide-  
antur, Benacinum carponem, Padanum silurum, & e mari plures pisces Larianis truttis uel an-  
teponere, uel exæquare solent, & item Soranæ trutte in eo genere principatum attribuant, quã  
maximè fallantur. ¶ In Veneto lacu, id est, inferiore Acronij parte capte, præferuntur ips quæ  
in superiori parte capiuntur. Item quæ circa fundum seu uadum pascuntur, illis quæ circa sum-  
mam aquam, utpote pinguiores, Maio mense præcipue commendantur à loutio: à nostris Febria  
rio: ab alijs simpliciter æstate, dum pulpæ earum rubent, eum enim colorem amittit, ut diximus,  
cum flumina subeuntes pariunt declinante lunio, simulq; speciem & faporem, itaq; autumno &  
hyeme non laudantur.

Trutte pinguiores, ut sunt Larianæ, multo succo replere corpora, genitalemq; humorem co-  
piose suggerere dicuntur, (uti Auicenna de omnibus propè piscibus, si recentes & calidi come-  
dant, uno edictio pronunciauit.) agris tamen euidentissimè nocent, utpote quæ tardè laboriosèq;  
in stomachis aterantur et fecerant. At fluuiales truttas (ut in ipsarum historia dictum est) medici blan-  
diores agris apponere non dubitant, loutius.

Coquantur concise in tabellis in lebetibus lapideis torno fabricatis, simplici in aqua, multo  
sale indito, aliãq; subinde accersita condimenta penitus aspernantur. Multo enim quodam pri-  
uine simili paulò post sponte emisso rubentes pulpæ protinus efflorescunt, ita ut quum refrixerint  
multo gratiores esse uideantur. Morus tamen nobilis parasitus, truttam cubitalem in præpinguis  
40 capi itre coquendam esse censèbat, loutius. Trutte elixandæ frusta macerentur priòs per di-  
midium horæ in frigida fontana aqua: deinde in feruens uinum æquali aqua dilutum iniectæ co-  
quantur, Spina doris, & cauda asæ, uel principum mensis inferuntur, Mangoldus.

COROLLARIUM IIII. DE VMBELIS, SABAV-  
dicæ dictis, Trutte lacustris speciebus.

Eiusdem piscis, nempe Umbelæ minoris icones duas, ut à diuersis piscatoribus non eodem tempore no-  
bis delineate sculptæ, sunt, posuimus. Rondeletius maioris & maxi-  
mæ Umbelæ imagines dedit.

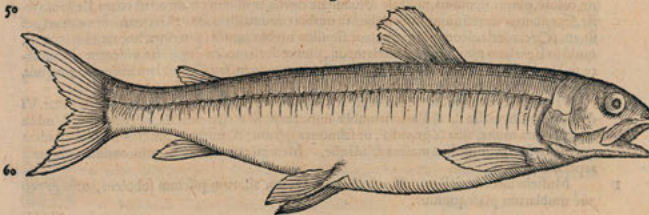


Fig. 12: The “umbla minor”, female specimen. Conradi Gesneri medici Tigurini Historiæ animalium liber IIII. qui est de piscium & aquatiliu animantium natura. [Zürich]. Tiguri: apud Christoph. Froscouerum, anno 1558, page 1211 (ZBZ, Alte Drucke und Rara, NNN 48).



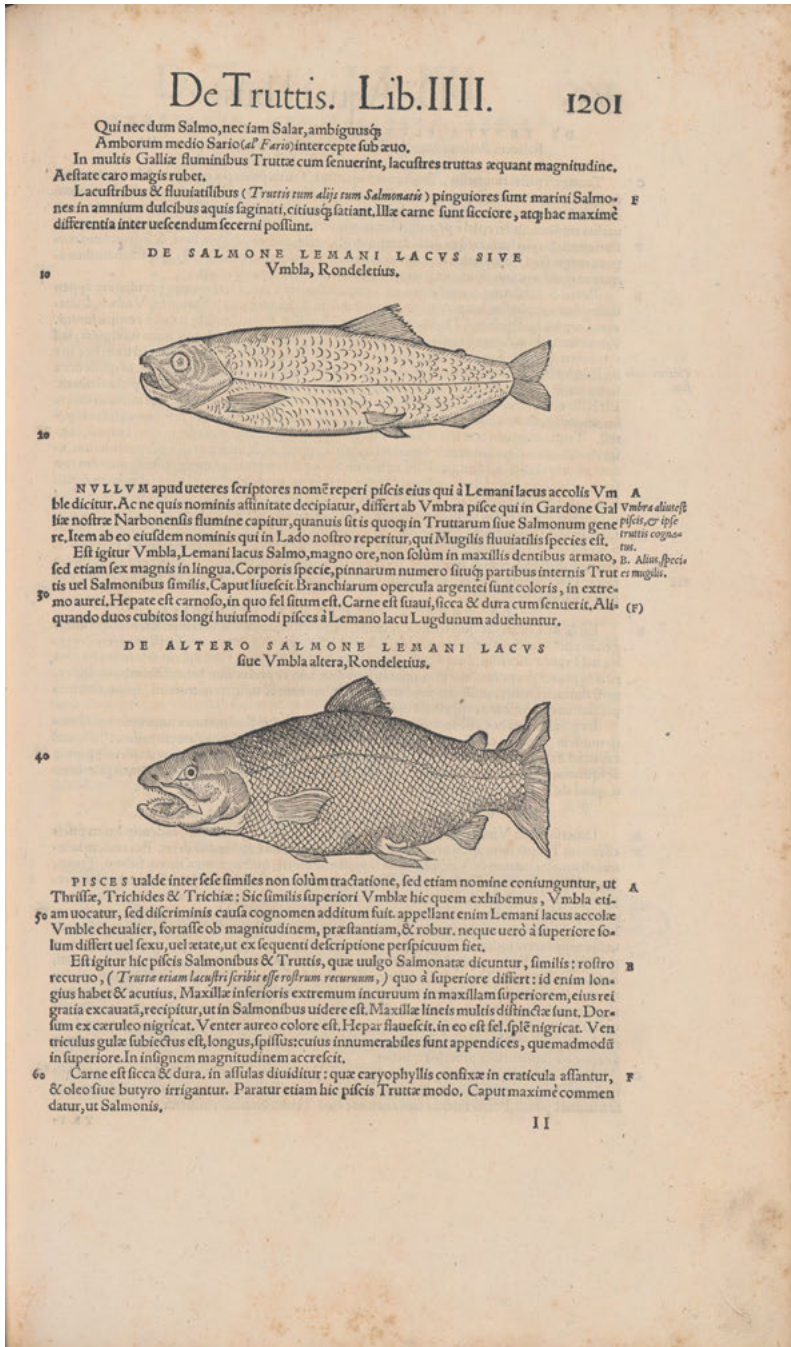
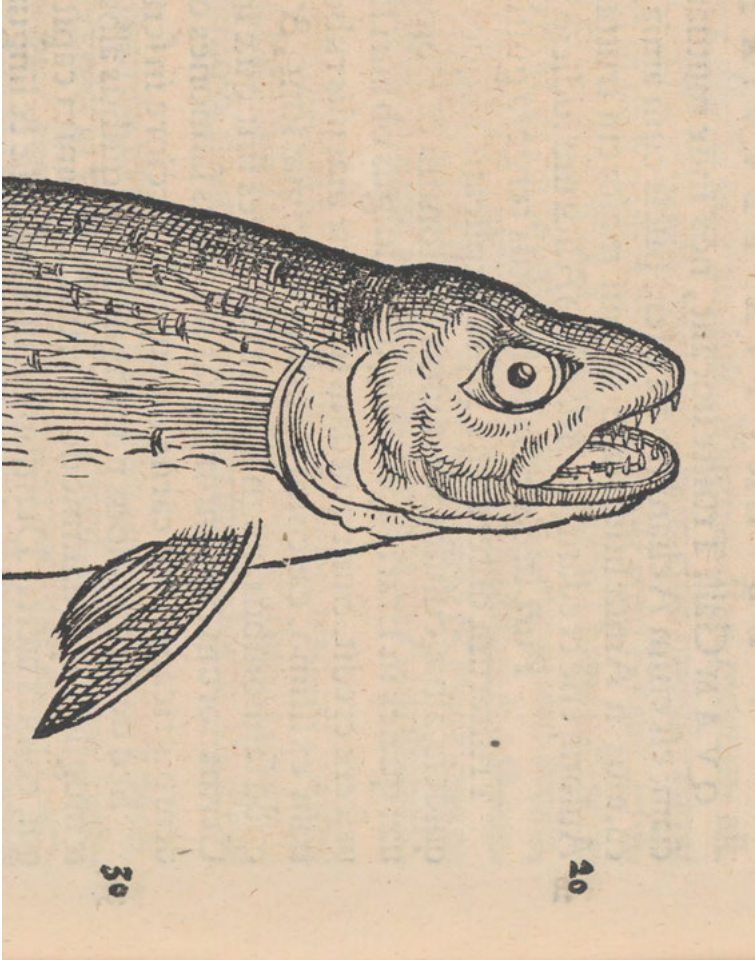


Fig. 13: The “Umbla maior” or “Grossen Rötelin” and “Umbla maxima” or “Grösten Rötelin”. Conradi Gesneri medici Tigurini Historiae animalium liber III. qui est de piscium & aquatiliū animantium natura. [Zürich]. Tiguri: apud Christoph. Froschouerum, anno 1558, page 1201 (ZBZ, Alte Drucke und Rara, NNN 48).



**Fig. 14:** The prominently depicted teeth of the trout. Conradi Gesneri medici Tigurini *Historiae animalium liber IIII. qui est de piscium & aquatiliū animantium natura*. [Zürich]. Tiguri: apud Christoph. Froshoverum, anno 1558, page 1200 (ZBZ, Alte Drucke und Rara, NNN 48).

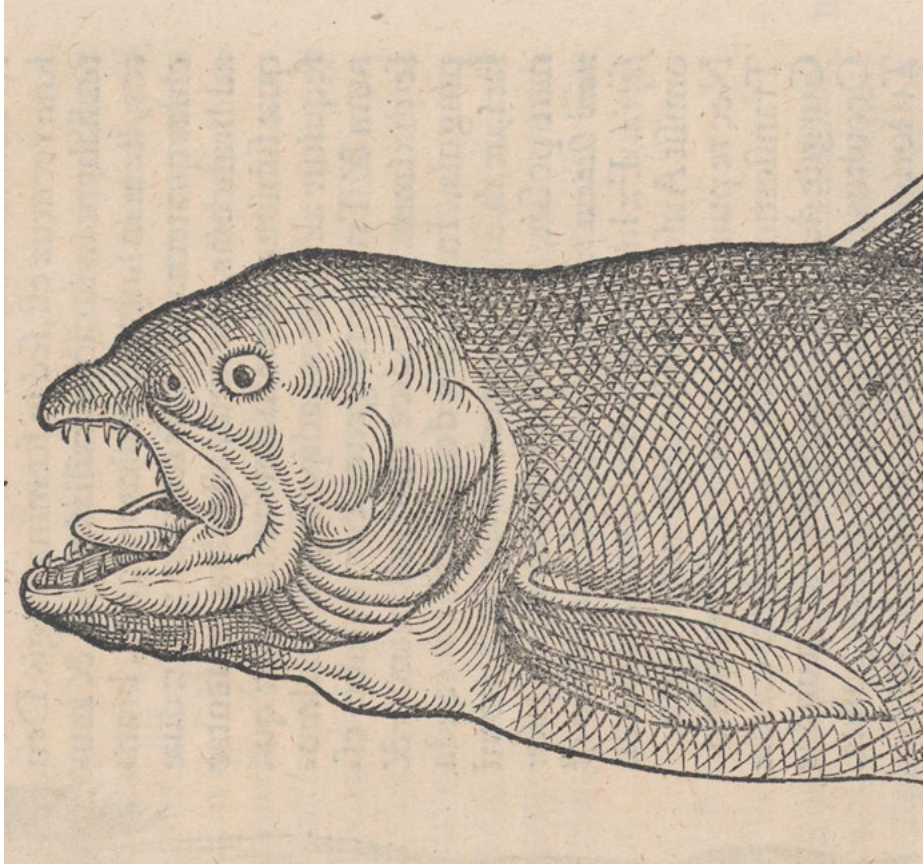
placed on this is reflected in the fact that in the depictions of his most common salmonids, the salmon<sup>78</sup> and the trout,<sup>79</sup> as well as several others, these are prominently shown.

Similarly, other characteristics that can help identify a species are clearly depicted. Such characteristics are those in which a species deviates from the characteristics described in the context of the salmon and the trout. These include for

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78 Figure 15.

79 Figure 14.



**Fig. 15:** The prominently depicted teeth of the salmon. Conradi Gesneri medici Tigurini *Historiae animalium liber IIII. qui est de piscium & aquatiliū animantium natura*. [Zürich]. Tiguri: apud Christoph. Froschoverum, anno 1558, page 969 (ZBZ, Alte Drucke und Rara, NNN 48).

example also their relatively small scales, and a broad tongue.<sup>80</sup> The grayling deviates from the norm on these counts; it has larger scales and a much smaller tongue and mouth than the other members of the *Salmonidae* family. In the included depiction,<sup>81</sup> these characteristics are prominently shown. While in the depictions of other species, for example the salmon,<sup>82</sup> the scales are not or barely depicted, the grayling was depicted with very large scales.

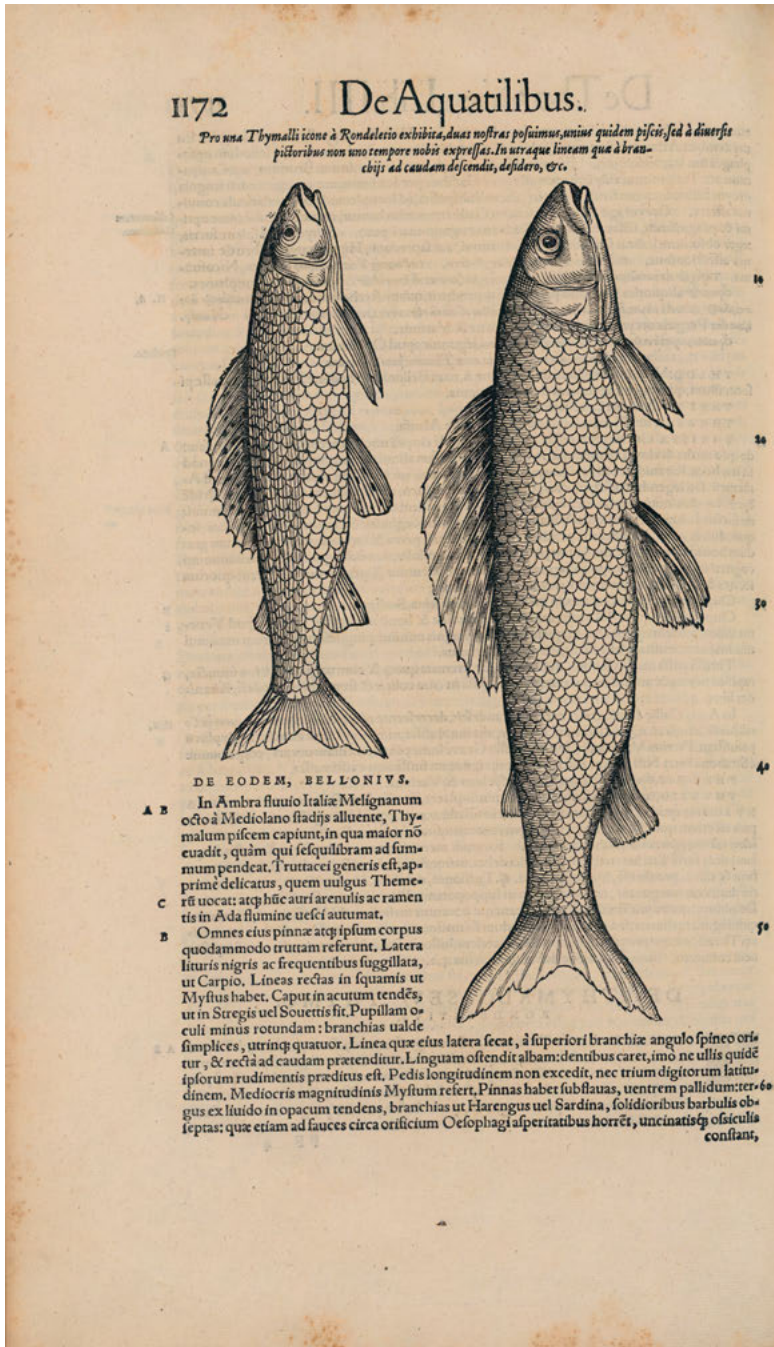
How should we interpret such depictions? In general, while Gessner's ichthyological woodcuts, which he classifies as 'ad vivum', are somewhat schematic, much

<sup>80</sup> Gessner (1558), p. 973, B 23–45: "*quanquam perexiguus opertum squamis [...] lingua quoque dentata, brevis, lata, carinata.*"

<sup>81</sup> Figure 16.

<sup>82</sup> Figure 8 and 15.





**Fig. 16:** The grayling. Conradi Gesneri medici Tigurini Historiæ animalium liber IIII. qui est de piscium & aquatiliū animantium natura. [Zürich]. Tiguri: apud Christoph. Froshoverum, anno 1558, page 1172 (ZBZ, Alte Drucke und Rara, NNN 48).

care was taken to clearly show those characteristics that are needed for identification of the depicted species. On the other hand, characteristics that were not useful in this context, such as the scales of the salmon, were often neglected. Consequently, many of Gessner's ichthyological illustrations cannot be considered portraits of a specimen, but rather are depictions which provide specifically that information that is needed for identification. In this context 'ad vivum' then appears to signify not so much that the depiction is a representation of a specimen,<sup>83</sup> but rather of the species, and the depictions appear to have been produced with a taxonomical perspective in mind.

That some thought went into this is clear when we compare the woodcuts to the models upon which these were based. Gessner's description of the "*umbla minor*" for example is illustrated with two depictions<sup>84</sup> which are slightly different. One of the depicted fishes is smaller, has a slightly less robust body, and a considerably smaller dorsal fin. It appears therefore that a female and male specimen have been depicted, the female of this species being smaller and having a smaller dorsal fin. This notwithstanding, these woodcuts were based on one single drawing.<sup>85</sup> Similarly, depictions of a male and female grayling<sup>86</sup> were included, both of which were based on the same drawing.<sup>87</sup> Other, less substantial, changes to the original were also made in the woodcuts. For example, Gessner's woodcut of the *Coregonus wartmanni* or *Adelfisch* was based on a depiction accompanying Rondelet's description of this species,<sup>88</sup> which shows a fish with a sharp nose. In reality this is slightly stumpier, and in Gessner's woodcut this has been rectified. Since Gessner indicates that he has seen the species,<sup>89</sup> it is likely this improvement was based on observation. When we consider such alterations made to the depictions, we can see that the models were not mindlessly copied by the woodcutter, but rather alterations facilitating identification were made.

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**83** As pointed out by Sachiko Kusakawa, with this phrase Gessner referred to the effect an image had on the beholder, rather than the question whether an image was a true portrait of something in nature. What mattered was that the reader formed an understanding of the depicted object. Kusakawa (2012), pp. 175 and 251.

**84** Figures 11 and 12.

**85** Both woodcuts are based on a single drawing from Gessner's collection. Platter (University Library Amsterdam, Ms III C 22), f. 29. The "*Rötele*" from Mangolt's *Fischbuoch* (p. 38 *Wintermonat*) was based on the same model drawing. Gessner (1558), pp. 1212; Gessner (1560a), p. 343; Gessner (1562a), f. 190r.

**86** Gessner (1558), p. 1172; Gessner (1560a), pp. 313–14; Gessner (1562a), f. 174r. and 174v. The male grayling is considerably larger than the female, which has been accurately depicted.

**87** Platter, University Library Amsterdam Ms C III 22, f. 24 (16th century).

**88** Rondelet (1554), p. 162.

**89** Gessner (1560), p. 341: "*Mihi quidem species duae unius generis proxime videntur.*" Figure 1.



## Conclusions

While this takes place on an intuitive level, across Gessner's ichthyological work groups of species are identified which make sense from a taxonomical point of view. As a consequence, these groups often largely correspond with current taxonomy. *Felchen* are nowadays still considered salmonids, and those species which Gessner describes as *truttae* in the current taxonomy all fall within the *Salmonidae* family, in which *Felchen* form a distinct genus. In Gessner's work such groups are formed based on physical characteristics shared by the various members of the group. In the case of salmonids, or *truttae*, this includes an adipose fin. The relation between the various members of the group is emphasised through their nomenclature, in each case it is mentioned that the described species is an "*albula*" or a *trutta*.

At the same time attention is paid to the differences between the various members of the groups as a means to distinguish between them. To this end, species are compared to the characteristics of common species such as the trout and salmon, and deviations from this norm are highlighted. Identification is further facilitated by the extensive attention which is paid to issues which could complicate this, such as the physical differences between juveniles and adults and other physical differences which can occur within the same species. As a result, it can be easily determined whether species belong to a certain group and these species can be easily identified. This attention to those matters important for identification is also reflected in the included illustrations. Identification is facilitated by depictions showing both young and old and male and female specimens, as well as variants of the same species. In addition, those characteristics which aid identification have been clearly depicted, while those characteristics which are less important in this context are often neglected.

Gessner's presentation of species as members of a wider group is an efficient tool to keep an overview and to save time as well as textual space. Of the twenty-three species of *Felchen* present in Switzerland Gessner described only four. As *Felchen* were well-known species in Switzerland about which Gessner spoke to local fishermen, it is clear that while information about a greater number could be obtained, the number of included species was consciously limited. Attempting to describe all would have been a challenge, while the here applied approach, where general information about the group is provided, meant the author could present a description that applied to all species of *Felchen* while only specifically mentioning a few. The same applies to the wider group of the *truttae*. The fact that general characteristics which apply to the entire group, such as the adipose fin, are provided means that one could easily check whether any not yet described species possesses these. Once established that the species belongs to this group, it can be distinguished from the other species by its deviation from physical characteristics listed in the descriptions of the salmon and the trout.

Generally this approach to description cannot be seen to the same extent in the ichthyological works of Gessner's contemporaries. Although some references to wid-

er groups of species are expressed in the work of Guillaume Rondelet, these are much more limited. For example, Guillaume Rondelet explicitly connects only the salmon, the Lake Garda trout, the Arctic char, the grayling, and the *C. Wartmanni* with the trout. Gessner on the other hand connects the four *Felchen*, the salmon, the trout, the Danube salmon, the arctic char and the Lake Garda trout. In addition, Gessner provides guidelines for the identification of species as belonging to a group and to tell these species apart from one another, as well as descriptions of issues which can complicate identification. These are distinct improvements to those provided by others. Furthermore, Gessner consistently used nomenclature which indicates that a species belongs to such a group, such as the use of the terms *truttae* and "*albulae*". Consequently from a taxonomical point of view *De Piscium* and Gessner's later ichthyological work is innovative in relation to that of his contemporaries, including those renowned for their studies of fish, such as Guillaume Rondelet and Pierre Belon.

