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"CARPES POUR LE DUC ....:" THE OPERATION OF FISH PONDS AT LAPERRIÈRE-SUR-SAÔNE, BURGUNDY, 1338-1352

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ABSTRACT: Archaeozoological and historical investigations on the role played by fishing activities in the past are, to a large extent, complementary with archaeologists concentrating on "post-consumption" evidence and economic historians concentrating on "pre-consumption" (i.e., production and distribution) data. In order to exemplify such statement, the present paper discusses, from the standpoint of strictly documentary records, one of the most emblematic enterprises of medieval fish production systems, the operation of fish ponds, in one of the most emblematic regions of medieval Europe, the dukedom of Burgundy (France).

KEYWORDS: FISH, FISHPONDS, FRANCE, MIDDLE AGES, HISTORICAL RECORDS

RESUMEN: Las investigaciones arqueozoológicas e históricas acerca del papel desempeñado por las actividades pesqueras en el pasado son, en no poca medida, complementarias dado que los arqueólogos se ocupan de investigar la información posterior al consumo del pescado en tanto que los historiadores se concentran en los datos anteriores al consumo (es decir, lo relativo a la producción y distribución). A fin de demostrar tal aseveración, en el presente estudio se valora, desde una perspectiva estrictamente documental, una de las más emblemáticas actividades pesqueras medievales, la cría de pescado en estanques, en una de las más emblemáticas regiones de la Europa medieval, el ducado de Borgoña (Francia).

PALABRAS CLAVE: PESCADO, ESTANQUES DE CRIA, FRANCIA, EDAD MEDIA, REGISTRO HISTORICO

Fish remains examined by ichthyoarcheologists are usually recovered "samples" from what now survives of fishes humans once consumed. The evidence is precisely locatable and quantifiable but hazily dateable. From this "end product" archeologists infer antecedent taphonomic and economic processes whereby the fish had been disposed of, eaten, prepared, distributed, and produced or captured — to say nothing of the living fish population itself. Only rare finds of object identifiable as fishing gear or traces of structures like ponds or weirs give direct evidence of production.

An economic historian has much to gain from hearing archeologists extract meaningful social and ecological data from the "post-consumption" evidence. I am struck by the differences not in our intellectual processes of enquiry but in the places we begin. Our disciplines are complementary. For archeologists, consumption is easy, production hard, but for historians the reverse is more often true (Stuard, 1985). Hence I will, in turn, report to you about certain fish located precisely in time and space and counted with great care as they came out of the water en route to some of the most noble tables (and ultimately, midden heaps) in medieval France. In so doing I would establish a firm and well-documented datum or reference point for the scale, technology, and economic role of carp culture in western Europe, where the fish was not native, before the Black Death of 1348-51 and its demographic consequences set a well-known caesura in the history of the preindustrial European economy.

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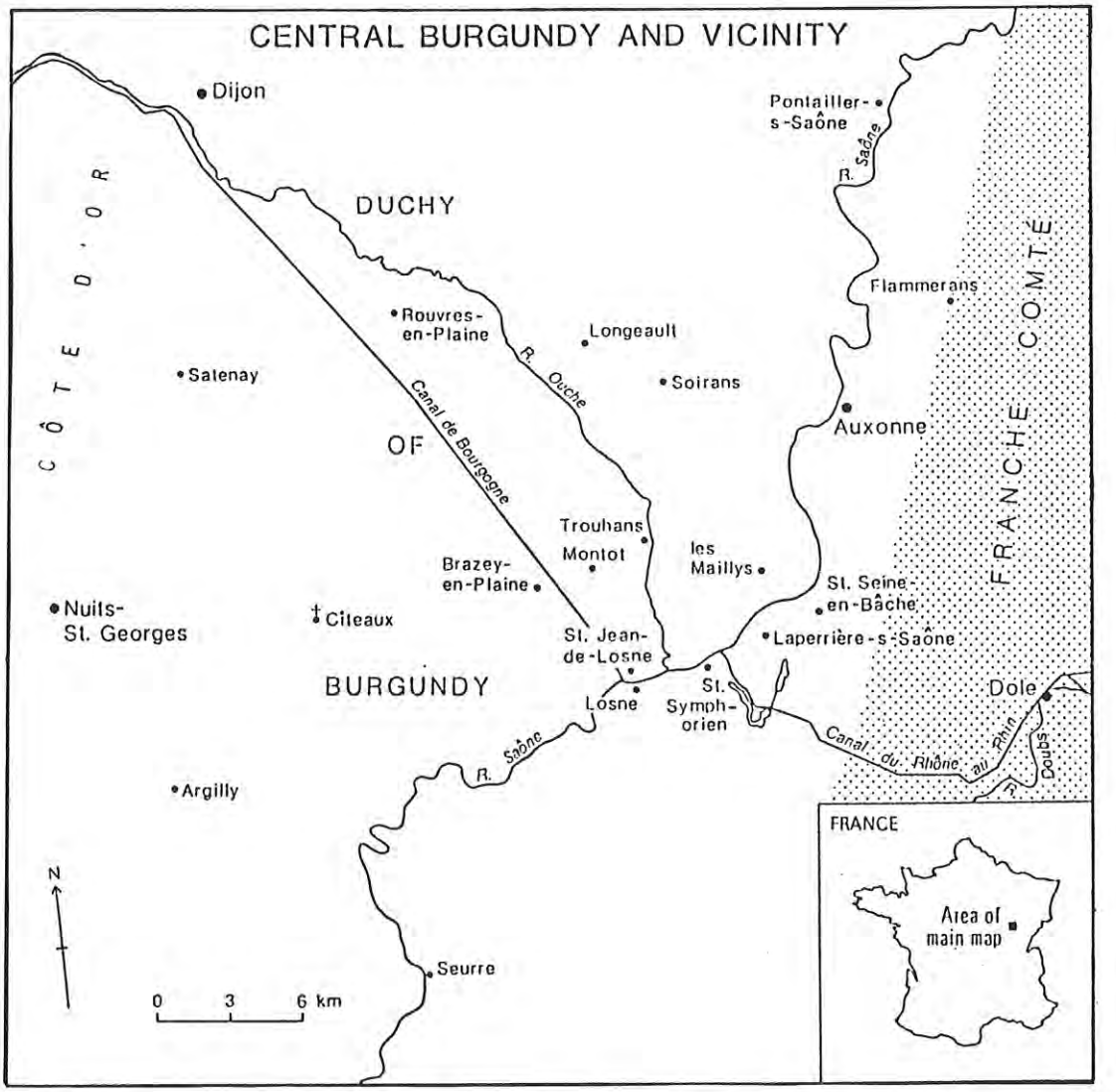
I work not with bits of bone but with pigmented markings on (in this case) dried calf skins — the account books kept in 1338-40 and 1344-52[2] for Robert de Saint Symphorien and Jean de la Roichote, successive castellans at Laperrière-sur-Saône for Eudes IV (1315-49), penultimate Duke of Burgundy from the Capetian house[3]. These officers were responsible to manage the duke's lands, rights, and affairs in a territory some 10-15 kilometers from the towns of Auxonne and Dôle along the duchy's eastern frontier with the Franche-Comté [Map 1]. By the early fourteenth century an inchoate Burgundian financial administration, the future *Chambre des comptes*, supervised the duke's local subordinates by having them keep and present for central review annual accounts of their activities.



MAP 1. Drawn by the Cartographic Drafting Office, Department of Geography, York University.

(2) Dijon: Archives Departmentales de la Côte-d'Or, B 5051 bis and B 5052. Henceforth cited by manuscript and leaf (fol.).

(3) Eudes was followed by his young grandson, Philippe de Rouvres, whose widowed mother Jeanne transferred the regency to her second husband, Jean, Duke of Normandy. Jean became King of France in 1350. Philippe died without issue in 1361.

The Chambre retained virtually undisturbed in its Dijon offices hundreds of these account books until, after the Revolution, appointed archivists of the French national state could take them over, catalog them, and preserve them for scholarly use (Jassemin, 1918: 102-41; Richard, 1954: 389-516; Rigaud, 1984: 12-16). This chain of events now lets us trace the incomes and expenditures handled on the duke's account by the mid-fourteenth-century castellans of Laperrière.

Like others of their colleagues, Robert and Jean managed for their lord some appreciable fisheries resources. Robert's account notes early on "Received from the sale of fish from the pond of St. Seine which was fished in Lent in the year 38" £203 11s from 4528 carp, £72 2s 6d for 2850 small bream sold by the hundred, and £13 for 40½ baskets of small bream (B 5051 bis, fol. 3r)[4]. In all, during that fishing season Robert accounted for 11,853 carp, 9350 small carp, 200 foot-long bream, and 2850 plus the 40½ baskets of smaller bream worth more than 657 livres, of which more than 294 livres were receipts from fishes sold. Jean then saw to the fishing of the St. Seine pond twice. As is laid out in Table 1, in 1345 it produced more than 11000 full-grown carp, 31000 young carp, and 400 pike, and in 1350 some 22000 young carp, baskets of bream, and more pike. These yields were two and more times greater than either the harvests of adult carp or the stockings of carp fry elsewhere reported from ponds in fourteenth-century France (Guérin, 1960: 131-36; Gresser & Hintzy, 1978: 140 and 148; Richard, 1983: 187-89)[5].

The pond of St. Seine no longer exists but its site can be precisely located. Two kilometers northeast of Laperrière the village of St. Seine en Bâche rests on a terrace about twenty meters above the Saône on its north and almost the same over a tributary valley on its south [Map 2]. From there that valley now curls southwest, then northwest around Laperrière, and is cut by the eighteenth-century Canal du Rhone au Rhin before emptying into the Saône between the latter village and St. Symphorien. In its ten kilometer course the valley now holds a stream draining two artificial ponds, the Etang de l'Aillon and the Etang du Milieu, and upstream between the latter and the village of St. Seine a basin called "les mareaux." The Cassini map of this region done 1744/60 [Map 3] also shows, each with its straight, man-made dam, the Etang de l'Aillon at the bottom of the valley, an unnamed pond in its middle reaches, and a third and uppermost one just south of St. Seine.

(4) Easter began the calendar year in medieval Burgundy, so what Robert thought February-March 1338 was already 1339 by modern reckoning. All remaining dates in this paper are modernized without further comment.

(5) Modern wild (feral) carp observed world-wide show no regional differences in length-weight relationships (information from McCrimmon, 1968: 12-13; Carlander, 1969: 370-80 obtained courtesy of E.J. Crossman, Royal Ontario Museum). Adults at 40 cm run about 1.5 kg (3.3 lbs) and fry aged I- about 100 g (3.5 oz). The normal length and sexual maturity of Year IV and Year V carp in fourteenth-century St. Seine pond correspond with modern records from regions with similar summer temperatures and growing seasons. If the modern weights also roughly apply, both of the complete harvests detailed for St. Seine (1339 and 1345) yielded in the range of 20,000 kg of carp. Relative to that biomass, other reported fish added very little. But note in Table 1 the consistent 1:100 ratio of numbers between pike and carp of a comparable size.

MAP 2. The St. Seine site today. Source: 1/50000, Seurre.

MAP 3. The St. Seine site ca. 1744/60. Source: Carte Cassini, feuillet 115: Dôle.

	1339	1345	1350
carp ("1 foot and 1 palm")[1]	11853	11419	-
small carp ("fry")[2]	9350	31600	22200
bream ("1 foot")[3]	200	-	-
small bream[4]	2850	-	-
smallest bream[5]	40½ baskets	-	26 baskets
pike[6]	-	112	6
small pike[7]	-	323	249

Source: B 5051 bis, fol. 9r; B 5052, fols. 10v and 40r.

(1) *Cyprinus carpio* L. Called "carpes ... la piece d'un piez et pleine palme de long," so perhaps about 40 cm (16 inches) long.
(2) Called "carpaz" or "norriens de carpes."
(3) *Abramis brama* L. Called "brames d'un piez de long cou et tete" at B 5051 bis, fol. 9r, so perhaps 25-30 cm (11 inches) long.
(4) "brames vendu au cent."
(5) "bramaz vendu au panier."
(6) *Esox lucius* L., "luz."
(7) Called "quaricales," "lancerons," and "boichoz," invariably with the three words grouped as a single label. "Quaricals," in other texts often "quarrels," looks like the word for a crossbow bolt, which were about 35 cm (15 inches) long. A "lanceron" is a lance head, and semantically related to what would become the normal French for *E. lucius*, "brochet" (as ambiguously a fish or a lance as the English "pike").

TABLE 1. Fish taken from the St. Seine pond.

The top body of water was, of course, the "Etang de St. Seine," then seemingly about 1 by 1.5 kilometers at its widest points and covering something like 80 hectares[6]. Modern physiography suggests a maximum depth of 6 to 8 meters. If these dimensions also applied in the fourteenth century, St. Seine pond then resembled in scale as it did in size of harvest the ponds managed for commercial carp production by Lower Austrian nobles about 1500 (Knittler, 1989: 155-58).

The pond at fourteenth-century St. Seine had been formed behind a dam of earth and faggots that also supported a water-powered grain mill. Its level could be controlled by a sluice with a moveable wooden gate or "stopper" which was lifted to drain the water down a wooden trough. A channel some 200 "fathoms" (*toises*) long took water diverted or drained from the pond[7]. The technology using adjustable sluices and bypass channels which is visible in the Laperrière accounts of the 1340s had been employed a century earlier in central France and in southern, but not northern, England (Devailly, 1973: 556-62; McDonnell, 1981: 35-36; Roberts, 1986: 132-35).

(6) Carte Cassini (1744-1760), feuillet 115: Dôle. This record also confirms fourteenth-century hints that the ditch now cutting through the terrace about 0.5 km west of St. Seine is a recent construction. Ponds of l'Aillon and Milieu are well-recorded in the castellans' accounts, the latter with the lexically equivalent name "Moitant." See, for instance, B 5051 bis, fols. 9r, 15r; B 5052, fols. 6r (with explicit reference to "les 3 estangs de la Perrière"), 10v, 34r, 35v, and 47r-47v. For unknown reasons their fisheries are never there accounted in detail.

(7) Dams and mills: B 5051 bis, fols. 14v and 20r; B 5052, fols. 3v, 24r, 33r, 34v, 37v, and 49v. The accounts repeatedly (e.g., B 5051 bis, fols. 15r, 20r; B 5052, fols. 3v, 34v) specify that the *paule* of the *tou* was lifted to release the water. In the dialect of early twentieth-century peasant fish culturists in the Dombes, a district some 90 km south of Laperrière, the latter term denoted the entire sluicegate construction (Egloff, 1937: 85). The wooden *paule*, plainly the gate or stopper itself, was made by a local carpenter but 4 men were needed to set it in place (B 5052, fol. 4v). Also mentioned are troughs (*auges*: B 5052, fols. 21v and 46r) of wood and purchases of timber and iron nails for repairs (B 5052, fol. 47v). For the channel (*bief*), "above and below the dam to discharge the water," see B 5051 bis, fol. 4r.

In the mid-fourteenth century the duke's officers had fish harvested from the St. Seine pond every fifth or sixth year: 1339, 1345, and 1350. Each time they did this during the season of Lent, the six late winter and early spring weeks before Easter, when proper religious observance forbade meat to Christians. In 1345 the workers had to break ice on the pond in order to lift the sluice gate and begin letting out the water on 22 January; they started taking fish on 2 February. Other harvests began on the third and the 22d of the same month. Fishing continued well beyond Easter to dates between mid-April and late May. The longest season accounted covered 116 days but the account for 1345 specifies that 36 were not worked; the shortest was 73 days[8].

A special team of paid workmen was assembled, comprising three or four fishers with their chief, Regnault le tarroillon, a couple of unskilled helpers, and a clerk. All stayed for the duration in a purpose-built hut at the pond, and each was issued with his own newly-made pair of leather boots worth 12 sous each in 1339. They first cleared the bypass and drainage channels and prepared special wooden barriers called "crosses" to prevent the fish from escaping the pond with the waters. These Regnault and his men placed before and also in the sluice before they "lift[ed] the paule of the sluice gate" to discharge the water. As the level of the pond fell they went to work with a "large net," probably a seine, measuring 54 fathoms in length and costing a hundred sous when a new one was required in 1339. Perhaps when the water fell still further they used a long-handled dip net called a trulle[9]. Small fry for restocking went into a 30 by 40 foot storage tank the 1339 crew had excavated beside the pond. Other of their catch went into special wicker baskets or were wrapped for shipment in many yards of cloth sheets purchased in advance. Fishing techniques thus differed little from those recorded at other European pond fisheries of comparable date (Guérin, 1960: 137-40; Gresser & Hintzy, 1978: 143-46; Richard, 1986: 99-100; Roberts, 1986: 130-34)10.

As the catch was completed the pond had nearly disappeared, replaced with arable just in time to plant summer crops. The dry bed was farmed for a year in 1339-40 and two in 1350-51, yielding barley, oats, and perhaps hemp[11]. In both those seasons, too, major repairs were undertaken to the sluice and dam[12].

The mid-fourteenth-century catch from St. Seine pond went to three purposes: consumption in the ducal households, reinvestment in the duke's ponds, and market sale (Table 2). Patterns typical of each fish variety and size were modified by special situations in each year[13].

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(8) B 5051 bis, fol. 4r-4v; B 5052, fols. 4r-4v and 34v. Fishing seasons at St. Seine thus well exceeded those during the following half-century on ponds in Franche-Comté, where the harvest took only several weeks to a month (Gresser & Hintzy, 1978: 145).

(9) *Ibid.* B 5052, fol. 34v, specifies "une trulle...pour peschez a bief du dit estang pour ce que l'on n'y pouvait peschez au grand filet;" compare Wartburg (1966: 342) (with thanks to J. Richard). Size and price of the "big net" are given in B 5051 bis, fol. 4v.

(10) The "saunour de xxx piez de large et xl piez de lonc pour reposer le norien de carpaz" was made in 1339 (B 5051 bis, fol. 4v), but the baskets and "wrapping sheets" (*linceux*) are often mentioned (e.g., *ibid.* and B 5052, fols. 4v, 5r, 21v, and 34v).

(11) Field crops "from the pond of St. Seine" appear in B 5051 bis, fol. 17v, and B 5052, fols. 9v, 17r-17v, 38r-38v, and 49v.

(12) Work on the sluicegate was being done in late spring, 1340 (B 5051 bis, fol. 15r). The miller was indemnified when lack of water prevented his work in both 1350 and 1351, with the extra year plainly connected to the reconstruction of dam, sluice, and mill race still going on in August 1351. But by November 1351, the pond was refilled and restocked with fish. B 5052, fols. 34v, 37v, 46v, 47r, and 61r.

(13) Hereafter details from entries for "Missions..." in B 5051 bis, fols. 3r and 9r, and B 5052, fols. 10v, 33v, 34r, and 40r.

	CONSUMED	RESTOCKED	SOLD	TOTALS
1339				
carp large	625	7100	4528	"11853"[1]
small		9350		9350
bream large			200	200
small			2850 + 40½ baskets	2850 + 40½ baskets
value [estimated]				[£657]
1345				
carp large	11319	100		11419
small		31600		31600
pike large	112			112
small	324			324
value [estimated]				[?£1278?][2]
1350				
carp small		14000	8200	22200
bream small		26 baskets		26 baskets
pike large	6			6
small			249	249
value [estimated]	£10 14s. 3d.		£131 17s. 10d.	£366 7s 4d

Sources: B 5051 bis, fols. 3r and 9r;
B 5052, fols. 10v, 33v, 34r, and 40r

(1) *Sic* B 5051 bis, fol. 9r. Numerical total of entries is 12353.
(2) No current values or prices are given in 1345, so the value is estimated from prices in other years.

TABLE 2. Disposition of fish taken from the St. Seine pond. (Numbers are of fishes except where otherwise labelled).

Most pike and large carp but no bream were sent to residences of the duke and his family. 450 carp were shipped "pour la depense de l'ostel de Mons. le duc" in 1339. Duke Eudes split Lent of 1345 between Dijon and Dôle, so 1000 carp from St. Seine were carted the 34km and 140 the 10 km respectively to serve his needs. But the duchess that year stayed at Argilly castle about 40 km to the west, where she had delivered 10,179 large carp and 107 large pike. The large numbers of carp surely fed many ducal followers and servants, but the fewer pike likely met a more prestigious end. In 1350, the new and still preoccupied regent Jean, Duke of Normandy, though in residence at Dôle, took from St. Seine only six fine big pike[14].

Most small carp plus some bream and large carp the duke's estate managers put back into the duke's ponds to ensure their continued productivity. Most from St. Seine commonly reentered the same water just downstream in the Milieu and l'Aillon ponds. These received, for instance, more than half the carp fry caught in both 1345 and 1350 and all the bream not sold. In 1339 and 1345, however, significant quantities of carp were also shipped to stock ("empoissoner") four ponds under the control of other ducal officers. In the first year the castellan at Brasey en Plaine received 2500 full-grown and 2500 young St. Seine carp for the pond at Montot. Those fish needed to be moved only some 7-8 km, but 2800 fry in 1339 and 3600 in 1345 went about 28 km overland past Rouvres en Plaine to that castellan's Satenay pond. The prévôt at Auxonne took shipments of 2500 and 2000 fry to stock water at Flammerans and 200 adult fish for Noirot pond near Soirans. No water elsewhere, however, received as many as half the fishes taken from St. Seine or, indeed, of those placed for further growth in the other local ponds[15].

(14) Promptly eaten were probably also the 175 carp given in 1339 to the garrison commander at Laperrière for his household and the 6 sent in 1345 to M. Pierre de Bourg at Dôle.

(15) Pike from St. Seine are not recorded as artificially stocked, but some catches of wild fish were put into l'Aillon (B 5051 bis, fols. 4r and 15r; B 5052, fol. 47r-v).

What remained to be sold were some carp, small bream, and small pike in some years. No regularities are detectable in these and no buyers are named or identified. In 1339 just over a third of the large carp went for cash, in 1350 a like proportion of the small. In 1339 the small bream were all sold and in 1350 the small pike. Hence in those two years sales accounted for around a third of the probable total value of the catch, but from the intervening 1345 harvest no sales were made. Plainly mid-fourteenth-century Burgundy had markets for fish of both consumable and stockable sizes, and the duke's St. Seine pond could supply considerable numbers at times, but it was not managed to cater to that market more than occasionally (contrast Gresser & Hintzy, 1978: 146-49; Richard, 1983: 189-90; Richard 1986: 99-100).

Interpretive caution is required. Details present in the castellans' account from three consecutive fishings at St. Seine should suffice to ascertain the technical and the economic bases of the fishery. But the situation in spring, 1350, was peculiar. The plague had just savaged local peasant populations. A new and strange regent was replacing the old duke. Recent floods had damaged local hydraulic installations so extensive repairs were needed[16]. Whether for these or other reasons, the pond then was fished a year earlier than before, yielded no large cyprinids at all, and would lie dry not one year but two. Those special circumstances inhibit inferences from this third round of the cycle.

General conclusions may still be drawn, especially as to the (continued?) dominance of the ducal household economy in management of the ponds. Fish culture was practiced at mid-fourteenth-century Laperrière to put a special food on the table of the lord and his company. Visible changes in seigneurial needs induced changes in disposition of the product. The second consideration was reinvestment to assure continued production. Just as a grain farmer kept a portion of the harvest to seed the following year, the managers of the pond put the fry into other waters to grow into a future harvest. Consumption and short-term reinvestment for future consumption absorbed the lion's share of output from St. Seine. When these needs were satisfied a surplus could be sold. Sales were valuable but occasional, not the raison d'etre for rearing carp in the Burgundian duke's ponds before the Black Death. In this respect the enterprise more closely resembled that of the contemporary Bishop of Winchester than of the Count of Burgundy (Franche-Comté) in the next generation (Gresser & Hintzy, 1978: 130; Roberts, 1986: 127-30).

Rewatering St. Seine pond in autumn 1351 also called for repopulating it with fish. Indeed, only on this occasion do the castellans' accounts unambiguously record the intentional restocking of this uppermost pond in the system. During 1351-52 more than 20,000 carp fry (and some adults) were placed therein after removal from the moats (fosses) then being drained for repairs at Laperrière castle17.

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(16) Effects of plague deaths in the castellany of Laperrière are detailed for the accounting year of Martinmas 1349 to Martinmas 1350 at B 5052, fol. 32v and 42r, while reports that "l'aiguer avait gate et rompue" dams, sluices, mills, and discharge channels then are on fols. 33r and 33br. For repair work and reconstruction on St. Seine pond during 1350-52 see fols. 34v and 46v.

Duke Eudes died on 3 April 1349. On 9 February 1350 Countess Jeanne, regent for her minor son, married the royal heir Jean, Duke of Normandy, whose officials quickly assumed key posts in Burgundy. It was a turning point in Burgundian administrative practice (Jassemin, 1918: 130-31).

(17) B 5052, fols. 46v, 47r, and 59v.

Earlier evidence for intentional planting of fish in St. Seine pond is disturbingly vague, confined to a 1345 mention of fry sent from Rouvres and Auxonne "a empoissoner les 3 etangs de la Perriere," and one from 1349 where a ditch at the castle was to store fry for the same purpose[18]. Was this meant to include St. Seine? References do abound to the carting of carp fry to other ponds at Laperrière, notably Milieu ("Moitant") and l'Aillon, and elsewhere in the vicinity[19]. But the only earlier fishes seen entering St. Seine itself were "carp and fry which had climbed to there from Milieu pond" in 1339 and cost twelve sous to be put back where they belonged[20].

Certainly the pond culture then practiced under authority of castellans of Laperrière did not rely wholly on domesticated stocks and reproduction of captive fishes. In autumn 1351 an impending water shortage caused some 4000 bream, 160 small pike, and 20 carp to be taken from the St. Symphorien marshes ("les mares de St. Symphorien") and from Aulterive pond for transfer to l'Aillon. Back in 1340 the castellan even paid 52 sous for 140 *lancerons* to put into l'Aillon[21]. The evidence is thus of an incompletely artificial fish culture, but also of one engaged in impressively complex manipulation of wild and captive populations over a considerable area and several drainage (and pond) systems belonging to the duke.

One more side of Burgundian fish culture seen in the Laperrière accounts from before the Black Death is a broad relationship with local wage labour supplies. Continual use was made of both skilled and general workers.

Some individuals had become expert in pond culture. Notable among those employed at Laperrière was Master Regnault "le tarroillon"[22], who is found working around the ponds in every year of the account. Regnault had charge of the fishing at St. Seine in 1345 and 1350. He handled the construction of the storage tank for fry there in 1339, worked eight days in 1345 to install a new paule at Milieu pond, refurbished the dam at l'Aillon in 1349, and improved the channel at St. Seine in 1350. Early accounts imply that Regnault had his own assistants. Later ones recognize his special expertise. In 1350 the four fishers at St. Seine followed his leadership "under authority of the Gruyer," the ducal officer newly emerging with general responsibility for waters and forests (Vignier, 1960; Vignier, 1975: 1-5). The next year he even worked on rebuilding the duke's four ponds at Longeault, a day's journey away[23]. Master Regnault was at least on the way to becoming a specialized fisheries manager like later river keepers, pond masters, or *Vischmeister*.

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(18) B 5052, fols. 6r and 21v.

(19) Besides the stockings with St. Seine fry mentioned above, the accounts for 1350-52 detail movement of young carp among the wholly separate 4-pond complex called Soherne at Longeault about 15km to the north (B 5052, fols. 41-42v and 53v).

(20) B 5051 bis, fol. 15r: Five workers took two days to remove "le norien et les carpes qui y etainent montes de lestang du Moitant."

(21) B 5052, fol. 47r-v; B 5051 bis, fol. 15r (and compare fol. 4r). Only here do the accounts refer to transfer of live pike from one water to another.

(22) Some other manuscripts (see Gresser & Hintzy, 1978: 136 note 18) spell it "terrailon," literally "earth worker".

(23) He is sometimes also called "Regnault le menestrier [the joiner or carpenter]," but collation of all references supports identification as the same individual. For the appearances mentioned and others see B 5051 bis, fols. 4r and 14v; B 5052, fols. 3v-5r, 21v-22r, 33r-35v, 38r, 47r-50r, 53r-53v, and 59v. A similar character, "Nicholas the Fisherman," ran the Bishop of Winchester's ponds in Hampshire during 1244-62 (Roberts, 1986: 131-32).

Regnault was most often mentioned at Laperrière, but fellow tarroillons like Jean Pichelin and Angrat "le Grand" Peletier also worked with him there. Another Regnault was tarroillon at Brasey en Plaine[24]. In the early 1340s these men received 1 sou a day for construction work and 1½ for fishing, but in 1349-52 after the plague their wages ran at 3 and 4 sous daily or they were paid by the job. Master Regnault got 6 livres (120 sous) and his meals for handling the fishing at St. Seine in 1350[25].

Other artisans provided needed skills and products. The fishers (*pescheurs*) mentioned with regularity were, except for the *tarroillons* themselves, less commonly identified by name — though in 1345 some were employed from les Maillys and others from St. Jean de Losne and St. Symphorien, all villages along the Saône near Laperrière. They, too, were paid in cash and meals, 35 sous each in 1339 and 25 each in 1350[26]. Other craftsmen were hired by the day or the task in most years. Estiennot "le chapus [the carpenter]" got 2 sous a day to make a new *paule* for the Milieu pond in 1344, and the smith Mathiot le Sauve from Laperrière 66 sous 8 denier for supplying 3000 iron nails in 1350. Women from several nearby villages sold baskets to carry the fish[27].

Less skilled local villagers also found work at the duke's ponds. The fishermen's helpers got only 15 sous and food for the 1339 season and some years later mere "hommes de bras" who dug earth for dams 9 deniers a day when artisans were getting 12[28]. Dozens of peasants also hauled fish to ducal residences or just from one pond to another. Local cartage paid about 4 deniers the trip in 1345, but the journey to Argilly brought 6-8 sous[29].

Though the production of the fish culture enterprises belonging to the Duke of Burgundy was still in the decade before the Black Death more dominated by concerns for household self-sufficiency than for commercial markets, their labour supply had wholly departed from older manorial models. One unintended consequence was a sharp rise in labour costs after the epidemic.

Narrow conclusions and broader research strategies may be drawn from this initial probe into details of a pre-plague fisheries account. Whatever may be inferred from these records of practice at Laperrière belongs in an ecological setting of human population pressures against resources rather than the labour shortages and higher per capita incomes characteristic of post-plague conditions. Regrettably, the evidence cannot quite sustain truly quantitative assessment of either the ecological or the economic productivity of this pond.

Fully detectable are important features of the fish production system in pre-plague Burgundy. Techniques of handling water and fish in the ponds and reliance on wage labour already ranked with the best recommended preindustrial European standards. So did the emphasis on *Cyprinus carpio*. But this exotic species in mid-fourteenth-century Burgundy recalls the still unsolved puzzle of its spread from a native range on the middle Danube into western European river basins. The diffusion was certainly associated with human agency and the technology of artificial ponds. Plainly, research priority should be placed on identification and excavation of datable artificial pond, dam, and sluiceway structures in western Europe.

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(24) See, for examples, B 5052, fols. 3v, 5r, 17v, 33br, 53r, and 62r.

(25) B 5051 bis, fol. 14v; B 5052, fols. 4v, 5r, and 34v.

(26) B 5051 bis, fol. 4r; B 5052, fols. 4r-5v and 34v.

(27) B 5051 bis, fols. 4r and 15r; B 5052, fols. 3r and 33bv.

(28) B 5051 bis, fol. 4r; B 5052, fol. 5v.

(29) Most details are for the many shipments to Argilly in 1345 (B 5052, fols. 5v-6r), but later parallels occur at, for example, B 5052, fol. 34v.

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Operation of the St. Seine pond in late Capetian Burgundy did not, however, wholly anticipate the advanced European carp culture of later centuries. Market production remained an afterthought. Captive fish stocks were still partly sustained from wild populations and by natural processes with no clear signs of artificial feeding or breeding. This relatively early evidence thus pushes explanation of key technical innovations — pond technologies and domesticated carp — back into self-sufficient seigneurial and traditional peasant economic situations. It suggests several further desiderata for research on actual fish remains. I propose identification, excavation, and study of continental European sites already known from written sources for their practice of fish culture and their extensive consumption of fish. With a view to correctly recognizing and codifying the material evidence I ask if cyprinid remains of high and late medieval date could for a time receive attention like that hitherto given cod and herring. And I call for investigation of osteological features plausibly associated with the domestication of carp (Balon, 1974: 22-23).

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