



Sampling Fish for the Water Framework Directive

Lakes 2010

Lough Lene



Iascach Intíre Éireann
Inland Fisheries Ireland

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1.1 Introduction

Lough Lene (Plate 1.1, Fig. 1.1) is a limestone lake, situated in the Upper Boyne catchment in Co. Westmeath. It is located approximately 1km north of Collinstown and 4km north-east of Castlepollard. The lake has a surface area of 416.5ha, a mean depth >4m, a maximum depth of 20m and falls into typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and moderately alkaline (20-100mg/l CaCO₃).

Lough Lene is a clear, hard-water lake with areas of marl deposition. The lake supports a range of pondweed species including *Potamogeton perfoliatus*, *P. lucens*, and Canadian pondweed (*Elodea canadensis*) (NPWS, 2006). A variety of stoneworts such as *Chara pedunculata* and *C. curta*, indicators of marl or hard water lakes, are also present. Areas of woodland found along the shore include willows (*Salix* spp.), birch (*Betula* sp.) and alder (*Alnus glutinosa*) (NPWS, 2006). Bird species found along the shores of Lough Lene include mute swan, teal, pochard, great-crested grebe, little grebe, tufted duck, grey heron, water rail, mallard, golden eye, cormorant and wigeon (NPWS, 2006).

Lough Lene holds a small stock of large wild trout (O'Reilly, 2007), whilst perch, pike and tench are also known to be present. The average size of wild brown trout is 1.6kg and fish up to 5.5kg have been taken from the lake (O'Reilly, 2007). The lake is stocked by the Lough Lene Anglers Association with both brown and rainbow trout. From 2007 to 2010, between 5,000 and 10,000 brown trout were stocked annually. Over the same time period, between 7,000 and 26,000 rainbow trout were stocked annually.

Lough Lene was once home to a population of white clawed crayfish, a species that is listed on Annex II of the E.U. Habitats Directive. However, crayfish disappeared from the lake following an outbreak of the crayfish fungus plague in 1987. Crayfish were reintroduced following their eradication; however, unfortunately the plague reoccurred, leading to a second extinction (NPWS, 2007).

Lough Lene was previously surveyed in 2007 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007). During this survey perch, brown trout and pike were found to be the dominant species present in the lake. Tench, rainbow trout and three-spined stickleback were also captured during the survey.



Plate 1.1. Lough Lene

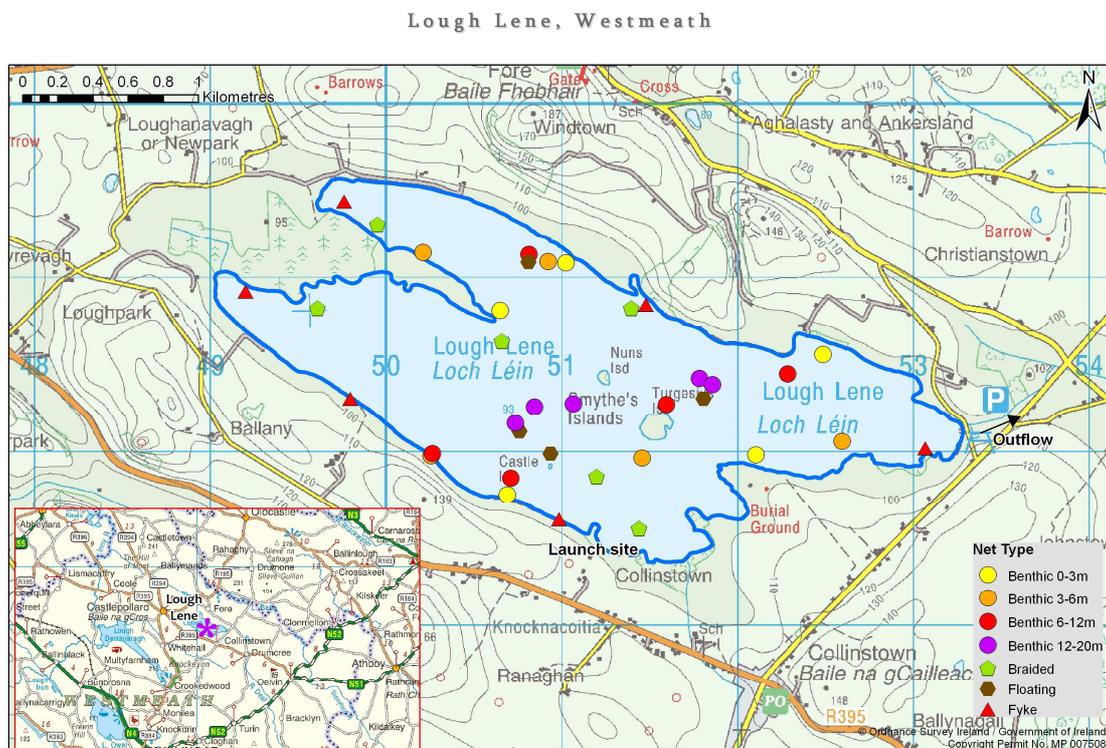


Fig. 1.1. Location map of Lough Lene showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Lene was surveyed over three nights from the 4th to the 7th of October 2010. A total of six sets of Dutch fyke nets, 20 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m and 5 @ 12-19.9m) and four floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (30 sites). The netting effort was supplemented using six benthic braided gill nets (62.5mm mesh knot to knot) at six additional sites. Nets were deployed in the same locations as were randomly selected in the previous survey. A handheld GPS was used to mark the precise location of each net. The angle of each gill net in relation to the shoreline was randomised.

All fish apart from perch were measured and weighed on site and scales were removed from all rudd, brown trout, rainbow trout and pike. Live fish were returned to the water whenever possible (i.e. when the likelihood of their survival was considered to be good). Samples of fish were retained for further analysis.

1.3 Results

1.3.1 Species Richness

A total of seven fish species were recorded in Lough Lene in October 2010, with 725 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded, followed by 3-spined stickleback, brown trout and pike. Small numbers of eels, rainbow trout and tench were also captured. During the previous survey in 2007 the same species composition was recorded with the exception of eels, which were not present during the 2007 survey but were captured in the current survey.

Table 1.1. Number of each fish captured by each gear type during the survey on Lough Lene, October 2010

Scientific name	Common name	Number of fish captured				Total
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	
<i>Perca fluviatilis</i>	Perch	675	0	0	5	680
<i>Gasterosteus aculeatus</i>	3-spine-stickleback	15	0	0	0	15
<i>Salmo trutta</i>	Brown trout (stocked)	6	0	3	0	9
<i>Esox lucius</i>	Pike	2	0	5	2	9
<i>Tinca tinca</i>	Tench	1	0	6	0	7
<i>Onchorhynchus mykiss</i>	Rainbow trout	2	0	2	0	4
<i>Anguilla anguilla</i>	European eel	0	0	0	1	1

1.3.2 Fish abundance

Fish abundance (mean CPUE) and biomass (mean BPUE) were calculated as the mean number/weight of fish caught per metre of net. For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. Mean CPUE and BPUE for all fish species recorded during the 2007 and 2010 surveys are summarised in Table 1.2. The brown trout figure includes both stocked and wild brown trout. Mean CPUE is illustrated in Figure 1.2.

Although the mean perch CPUE was slightly lower in 2010 than in 2007, this difference was not statistically significant. The differences in the mean perch CPUE between Lough Lene and three other similar lakes were assessed, with no significant differences being found (Fig. 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species recorded on Lough Lene, 2007 and 2010

Scientific name	Common name	2007	2010
Mean CPUE			
<i>Salmo trutta</i>	Brown trout	0.007 (0.003)	0.009 (0.003)
<i>Onchorhynchus mykiss</i>	Rainbow trout (stocked)	0.007 (0.004)	0.004 (0.002)
<i>Perca fluviatilis</i>	Perch	0.898 (0.218)	0.627 (0.138)
<i>Esox lucius</i>	Pike	0.007 (0.002)	0.008 (0.003)
<i>Tinca tinca</i>	Tench	0.005 (0.002)	0.007 (0.006)
<i>Gasterosteus aculeatus</i>	3-spine-stickleback	0.005 (0.002)	0.014 (0.011)
<i>Anguilla anguilla</i>	European eel	-	0.003 (0.003)
Mean BPUE			
<i>Salmo trutta</i>	Brown trout	3.650 (1.623)	8.518 (3.637)
<i>Onchorhynchus mykiss</i>	Rainbow trout (stocked)	6.008 (6.008)	3.686 (1.935)
<i>Perca fluviatilis</i>	Perch	35.254 (9.763)	41.179 (13.094)
<i>Esox lucius</i>	Pike	4.448 (2.986)	47.001 (24.468)
<i>Tinca tinca</i>	Tench	2.328 (1.149)	12.076 (11.320)
<i>Gasterosteus aculeatus</i>	3-spine-stickleback	0.019 (0.008)	0.008 (0.006)
<i>Anguilla anguilla</i>	European eel	-	0.663 (0.663)

* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species.

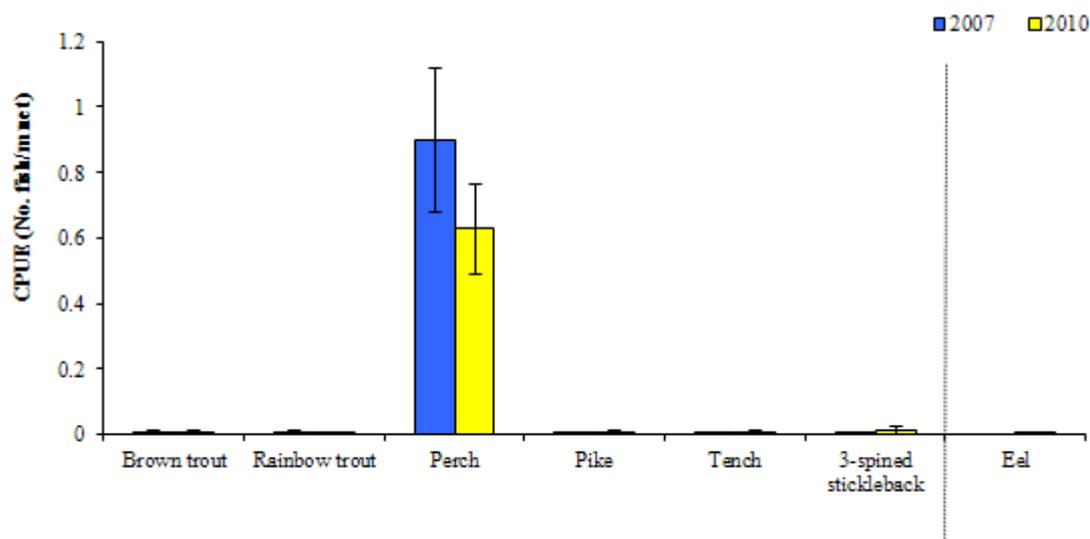


Fig. 1.2. Mean (\pm S.E.) CPUE for fish species captured on Lough Lene (Eel CPUE based on fyke nets only), 2007 and 2010

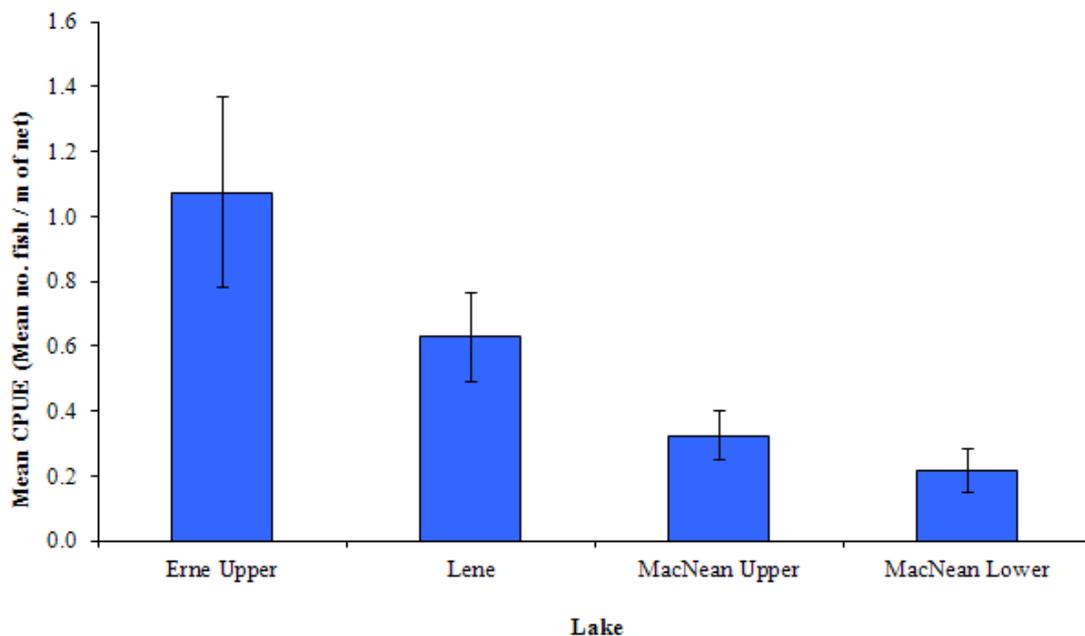


Fig. 1.3. Mean (\pm S.E.) perch CPUE in four lakes surveyed during 2010

1.3.3 Length frequency distributions

Perch captured during the 2010 survey ranged in length from 5.0cm to 31.4cm (mean = 13.7cm) (Fig. 1.4). Perch captured during the 2007 survey ranged in length from 3.6cm to 29.9cm (Fig. 1.4). Brown trout captured during the 2010 survey ranged in length from 26.9cm to 62.5cm (mean = 39.1cm) (Fig.1.5). Brown trout captured during the 2007 survey ranged in length from 31.5cm to 46.0cm (Fig.1.5). Tench captured during the 2010 survey ranged in length from 34.3cm to 50.83cm. Rainbow trout ranged in length from 36.0cm to 47.3cm. Pike ranged in length from 18.8cm to 102.5cm and 3-spined stickleback ranged in length from 3.72cm to 4.6cm. The one eel captured measured 55.6cm.

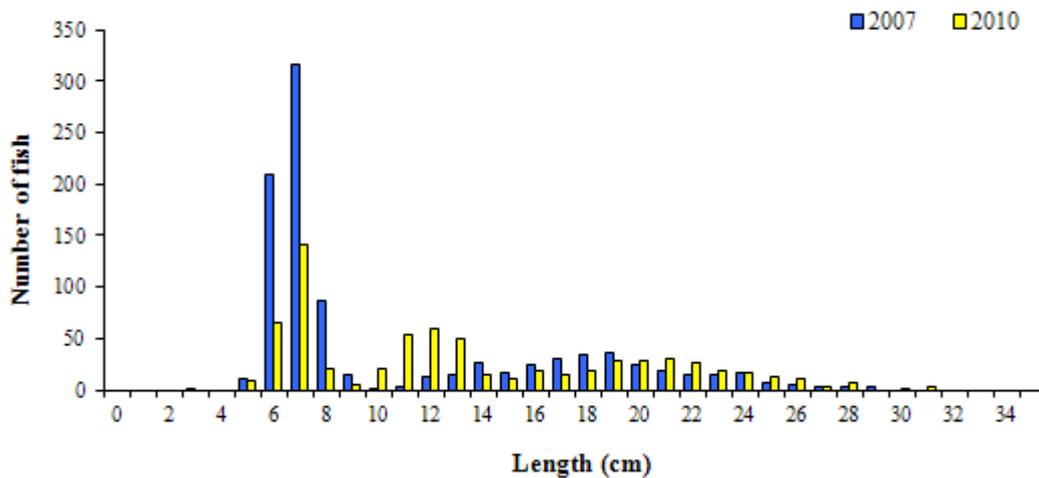


Fig. 1.4. Length frequency of perch captured on Lough Lene

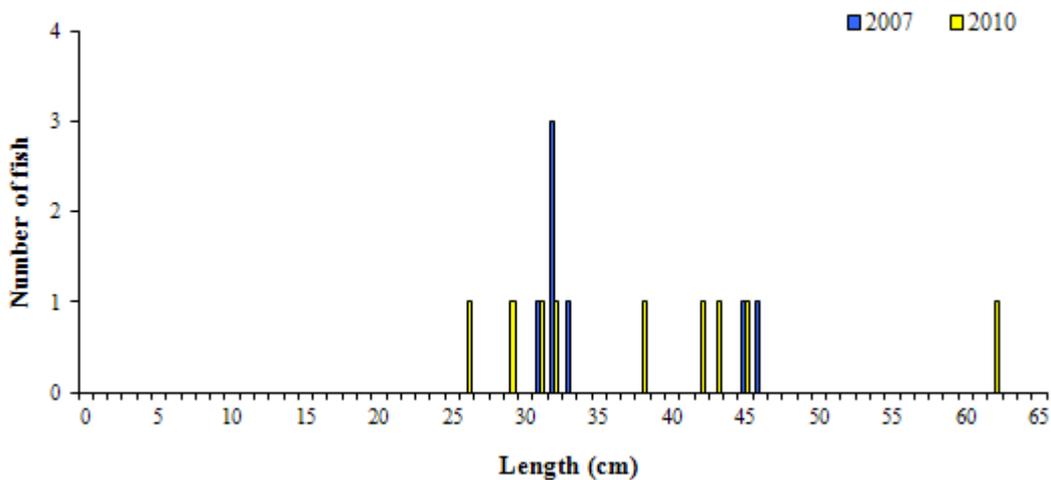


Fig. 1.5. Length frequency of brown trout captured on Lough Lene

1.3.4 Fish age and growth

Seven age classes of perch were present, ranging from 0+ to 6+, with a mean L1 of 5.8cm (Table 1.3). In the 2007 survey, perch ranged from 0+ to 5+ with a mean L1 of 6.2cm. The dominant age class in both 2007 and 2010 was 0+, corresponding to the 3cm to 8cm length class (Fig. 1.4).

All brown trout captured in 2010 were stocked fish. Two age classes were present, ranging from 2+ to 3+, with a mean L1 of 8.9cm (Table 1.4). In the 2007 survey, both stocked and wild brown trout were captured, ranging in age from 2+ to 4+ with a mean L1 of 9.0cm. Rainbow trout ranged in age from 2+ to 3+ and five age classes of pike were present, ranging from 1+ to 7+.

Table 1.3. Mean (\pm SE) perch length (cm) at age for Lough Lene, October 2010

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean	5.8 (0.1)	12.1 (0.1)	17.2 (0.2)	20.4 (0.2)	22.5 (0.3)	24.4 (0.7)
N	143	120	99	70	36	9
Range	4.2-9.1	8.5-16.6	12.2-20.7	15.0-24.6	17.4-27.9	21.1-28.9

Table 1.4. Mean (\pm SE) brown trout length (cm) at age for Lough Lene, October 2010

	L ₁	L ₂	L ₃
Mean	8.9 (0.6)	25.0 (0.9)	35.2 (0.3)
N	7	7	2
Range	7.2-11.7	21.2-28.1	34.9-35.5

1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and pike was the dominant species in terms of biomass (BPUE).

The mean perch CPUE in Lough Lene was similar to the other lakes assessed, with no statistically significant differences being found between lakes. Although the mean perch CPUE was lower in 2010 than in 2007, this was not statistically significant. The dominant age class of perch was 0+. Perch ages ranged from 0+ to 6+, indicating reproductive success in each of the previous seven years.

Lough Lene is stocked annually with brown trout and rainbow trout (a non native species). These hatchery reared fish have been released into the lake to create an angling amenity in the area, as the native brown trout stock have declined in recent years and can not support large fishing pressures. Only a small number of stocked rainbow trout and brown trout were captured during the present survey. These ranged in age from 2+ to 3+. Research has shown that stocked rainbow trout have a poor survival rate in the wild (e.g. ranging from 15% to 50% in the USA, Canada and Australia) (Bettinger and Bettoli, 2002; Teuscher *et al.*, 2003; High and Meyer, 2009).

Stocking of fish (including non indigenous species such as rainbow trout) has been identified as an action with potential to impact on the quality status of rivers and lakes and is listed as a pressure in the WFD REFCOND guidance document (Wallin *et al.* 2003). In WFD terms, it could impact on the ecological status class scoring system and would serve to drive down the water's quality rating. While this classifying may seem arbitrary to some it does reflect the concern of WFD to identify issues that are not appropriate in water resource (in broadest terms) management. Deterioration of ecological status is not permissible under WFD, unless in cases of major public or national importance.

A review of the survival of stocked fish in Lough Lene is recommended, and the stocking policy for the lake should also be reviewed and revised. The stocking programme developed should be consistent with EU legislation (WFD, Habitats Directive and the Fish Health Directive) and national programmes such as the National Biodiversity Plan. The revised stocking policy for the lake should include a review of habitat and spawning potential of the wild brown trout population, choice of stocked species, triploid versus diploid, timing of stocking events, catch and release policy, bag limits, and fin clipping of stocked trout.

Classification and assigning lakes with an ecological status is a critical part of the WFD monitoring programme. It allows River Basin District managers to identify and prioritise lakes that currently fall short of the minimum “Good Ecological Status” that is required by 2015 if Ireland is not to incur penalties.

A multimetric fish ecological classification tool (Fish in Lakes – ‘FIL’) was developed for the island of Ireland (Ecoregion 17) using IFI and Agri-Food and Biosciences Institute Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). This tool was further developed during 2010 (FIL2) in order to make it fully WFD compliant, including producing EQR values for each lake and associated confidence in classification. Using the FIL2 classification tool, Lough Lene has been assigned an ecological status of Poor/Bad based on the fish populations present.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Lene an overall ecological status of Good, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised at the end of 2012.

1.5 References

- Bettinger, J.M. and Bettoli, P.W. (2002) Fate, dispersal and persistence of recently stocked and resident rainbow trout in a Tennessee tailwater. *North American Journal of Fisheries Management*, **22**, 425-432.
- High B. and Meyer, K.A. (2009) Survival and Dispersal of Hatchery Triploid Rainbow Trout in an Idaho River. *North American Journal of Fisheries Management*, **29** (6), 1797-1800.
- Kelly, F. and Connor, L. (2007) *WFD Surveillance Monitoring - Fish in Lakes 2007*. Central Fisheries Board report.
- Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. and Champ, T. (2008) *FISH IN LAKES Task 6.9: Classification tool for Fish in Lakes. FINAL REPORT*. Central Fisheries Board, NSSHARE project.

NPWS (2006) *Site synopsis: Lough Lene. Site code: 002121.* Site Synopsis report, National Parks and Wildlife Service.

NPWS (2007) *Site synopsis: Lough Lene. Site code: 002121.* Site Synopsis report, National Parks and Wildlife Service.

O' Reilly (2007) *Loughs of Ireland. A Flyfisher's Guide.* 4th Edition. Merlin Unwin Books

Teuscher, D.M., Schill, D.J., Megargle, D.J. and Dillon, J.C. (2003) Relative Survival and Growth of Triploid and Diploid Rainbow Trout in Two Idaho Reservoirs. *North American Journal of Fisheries Management*, **23 (3)**, 983-988.

Wallin M., Wiederholm T. & Johnson R.K. (2003) *Guidance on Establishing Reference Conditions and Ecological Status Class Boundaries for Inland Surface Waters.* CIS Working Group 2.3-REFCOND 93pp. Final version 7.0, 2003-03-05)

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