AMENDMENTS TO APPENDICES I AND II OF THE CONVENTION

A. PROPOSAL

Inclusion of Hirudo medicinalis in Appendix II.

B. PROPONENT

The United Kingdom of Great Britain and Northern Ireland.

C. SUPPORTING STATEMENT

1. Taxonomy

11. Class: Hirudinea

12. Order: Arhynchobdelliformes

13. Family: Hirudinidae

14. Species: Hirudo medicinalis Linnaeus 1758

15. Common Names: English: medicinal leech
French: sangsue médicinale
Spanish: Sanguijuela

16. Code Numbers:

2. Biological Data

21. Distribution: Was once abundant from western and southern Europe to the Ural Mountains and countries bordering the eastern Mediterranean. Known from 26 countries, but no records have been obtained recently for Portugal or European Turkey. Elliott and Tullet (1984) provide a distribution map and references to records listed below (although details of the localities are not given); additional references in Wells et al. (1983) and Jazdzewska (1983).

Albania: 2 records (Elliott and Tullett, 1984).

Austria: 2 records (Elliott and Tullett, 1984); according to Kuhnelt (in litt., 30.09.86), only known population is in Lake Neusiedlersee.

Belgium: 2 records: 1 near Arlon (Maquet, 1985) and 1 near Tournai (d'Huart in litt., 10.09.84); previously not found since 1938. A possible third locality is being checked (Decraemer, in litt., 5.8.86).

Bulgaria: 2 recent records (Elliott and Tullett, 1984); formerly widespread but declining (Deltshev, in litt., 5.11.85).

Czechoslovakia: 4 records (Elliott and Tullett, 1984).

Denmark: Known from 31 localities on the mainland; observed at 11 of these localities from 1960-1986 and at 20 of the known 37 localities on the island of Bornholm (Baagoe and Jensen, 1985); Baagoe, in litt., 24.7.86). Elliott and Tullett (1984) mention 15 records.

Finland: 3 records (Elliott and Tullett, 1984); known from only a few localities on the south-west mainland coast and Aland Island (Wells et al., 1983).

France: 5 recent records (4 mentioned by Elliott and Tullett, 1984); including the Camargue and probably the Marais de Carentain, Normandy (Wells et al., 1983); Azay-le-Ferron (Indre) (Decraemer in litt., 5.8.86); and reportedly collected from around Bordeaux.

F.R. Germany: 10 records (Elliott and Tullett, 1984).

German D.R.: 11 records (Elliott and Tullett, 1984).

Greece: 5 records (Elliott and Tullett, 1984).

Hungary: 17 records (Elliott and Tullett, 1984); common in the Kisbalatan (Wells et al., 1983).

Ireland: No records; has not been found for at least a hundred years, but was abundant in the 18th century (Wells et al., 1983).

Italy: 10 records (Elliott and Tullett, 1984); there have been many records from most regions but few of these are recent (Wells et al., 1983); Elliott and Tullett, 1984).

Luxembourg: 2 records (Elliott and Tullett, 1984); in small ponds and rivulets south of Luxembourg City (Wells et al., 1983).

Netherlands: 15 records (Elliott and Tullett, 1984): rediscovered in 1946 after decades of absence.

Norway: 2 records (Elliott and Tullett, 1984); reported extinct in 1854, has been recorded at 6 localities since 1960, in the South (Okland, in litt., 5.10.82).

Poland: 27 records (Elliott and Tullett, 1984); originally scattered throughout the country excluding Upper Silesia and mountainous areas (Jazdzewska, 1983).

Portugal: No records.

Romania: 10 recent records (Elliott and Tullett, 1984): still abundant in lakes, marshes and wetland areas on the plains (Bacescu, in litt., 6.8.86).

Spain: 8 records (6 recorded by Elliott and Tullett, 1984); including the Aiguamolls de l'Empordà National Park (Castello d'Empuries, Girona) (Molinas, in litt., 21.7.86) and the Coto Doñana (Mountfort, 1958).

Sweden: 1 record (Elliott and Tullett, 1984); however a few localities have been recorded in the Province of Scania, and on the Baltic islands of Oeland and Gotland (Wells et al., 1983); in the 18th and 19th centuries, populations were boosted by importing leeches for the purpose of rearing them in ponds: such attempts were reportedly unsuccessful (Dahm, in litt., 15.9.82).

Switzerland: 4 records (Elliott and Tullett, 1984).

Turkey: No scientific records but reported to be collected for commercial purposes here (Wells et al., 1983; Fink, 1984).

UK: 19 records scattered throughout the country; once common but became less frequent by 1816 and was declared extinct in 1910. Rediscovered in isolated populations in Kent, New Forest, Lake District, Anglesey, Yorkshire, Islay, Argyll, and Sutherland (Anglesey population may have been destroyed as the lake has been drained and refilled since 1954). Five new localities have been reported since 1982, including Kenfig Pool West of Port Talbot.

USSR: 33 records (Elliott and Tullett, 1984); mainly southern USSR, Ukraine and Moldavia. Northern limit of range runs from just North of Baltic provinces to Yaroslavl District, South of the Kama Basin and Tyumen District, and to Barabinsk lakes and Altai (Lukin, 1957). It does not occur in western and eastern Siberia and in the easternmost parts of the USSR.

Yugoslavia: 3 records (Elliott and Tullett, 1984).

22. Population: Unknown. Believed to be rare in its western range but possibly more abundant in the eastern Mediterranean part of its range. Listed in the IUCN Invertebrate Red Data Book (Wells et al., 1983) as "Indeterminate" i.e. known to be 'endangered', 'vulnerable', or 'rare', but there is not enough information to say which of the three categories is appropriate. It is considered not threatened in three countries (Hungary, Norway, Sweden), extinct in one (Ireland), threatened or apparently threatened in twelve (Austria, Belgium, Bulgaria, Czechoslovakia, Denmark, Finland, France, Italy, Luxembourg, Poland, Romania, Spain) and its status is unknown in ten countries.

Albania: No information on status.

Austria: Vulnerable, as a result of habitat loss; Lake Neusiedlersee is undergoing considerable urbanisation, cattle grazing has stopped, the frog population has declined and waste material is dumped (Kuhnelt, in litt., 17.12.82). The leech does not seem to be immediately endangered there and the population appears to fluctuate from year to year (Kuhnelt, in litt., 30.9.86).

Belgium: Rare and threatened; becoming difficult to obtain (d'Huart, in litt., 10.9.84).

Bulgaria: Vulnerable; formerly widespread, some populations are still abundant but listed as vulnerable owing to habitat loss (Deltschev, in litt., 4.8.86).

Czechoslovakia: Rare; extinct in many parts of the country. Drainage of marshes is a threat (Spitzer, in litt. to Wells, 1982).

Denmark: Considered by Baagoe and Jensen (1985) to be vulnerable except on the Island of Bornholm.

Finland: Threatened - drastic decline owing to habitat loss since beginning of century (Wells et al., 1983); listed in Finnish Red Data Book.

France: Widespread drainage of marshes is a threat. Camargue population may be declining through changes in salinity.

F.R. Germany and German D.R.: Thought to be decreasing but exact status unknown.

Greece: No information, but was protected in 1980 (see below); may therefore have been considered threatened at that time.

Hungary: Abundant and not threatened. May be increasing.

Ireland: Extinct.

Italy: Few recent records, which may suggest populations are declining (Minelli, in litt., 15.12.82); Grassi Oriano, an Italian dealer states that leech populations are currently decreasing in Italy (in litt., 4.11.86).

Luxembourg: Threatened; although common in some areas, it is declining (Wells et al., 1983).

Netherlands: Status not known.

Norway: Not considered threatened (Solem, in litt., 10.9.86).

Poland: Intensive collecting caused a decline in populations by the 19th century. The species is now rare particularly in the Podlasie region of eastern Poland, due to marsh drainage and collecting (Jazdzewska, 1983).

Romania: Threatened; although still abundant in many areas but it is continously declining and being replaced by Haemopis sanguisuga (Bacescu, in litt., 6.8.86).

Spain: Rare; considered not threatened by Molinas (in litt., 21.7.86) but considered seriously threatened as a result of pollution, by Alvarado (in litt., 15.9.86).

Sweden: Common in the 19th century; has declined since but is not considered threatened (Wells et al., 1983).

Switzerland: No information.

Turkey: No information.

UK: Rare.

USSR: Rare.

Yugoslavia: No information.

23. Habitat: Occurs in freshwater ponds, streams and marshes. In Poland it is also found in peat bogs, swamps and marshes, and in Denmark it is found in small lakes and ponds on farm land as well as in forest, apparently irrespective of the degree of eutrophication (Baagoe, in litt., 17.11.86). It is more tolerant of anoxic water than other species and is often found in stagnant waters. Often associated with areas where farm animals graze and with populations of toads and frogs upon which the young feed. The leech is reported to bury itself during hot periods when the marshes dry out and to hibernate in cold weather.

3. Trade Data

31. National Utilization: The medicinal leech was used several centuries BC in ancient Rome, Greece, India and China. In the 19th century enormous numbers were used by European countries for blood-letting therapy. Before the war, leeches were used in the UK in the treatment of haematomas and inflamed areas, especially in the reduction of swellings close to the eye (Evered, in litt. to Stewart, 10.3.82). The largest current users are major pharmaceutical companies; uses are described under the section on international trade.

Austria: Not commercially exploited at Lake Neusiedlersee (Kuhnelt, in litt., 30.9.86).

Belgium: No local use known.

Bulgaria: Occasionally used in hospitals (Deltshev, in litt., 4.8.86).

Denmark: No known local use (Baagoe, in litt., 24.7.86).

France: RICARIMPEX, a major supplier to the pharmaceutical industry, has not disclosed its sources but had problems obtaining enough (RICARIMPEX, in litt., 30.6.81).

F.R. Germany: No information on locally collected specimens.

Hungary: One of the two known companies, MAVAD, supplies local hospitals and pharmaceutical companies with live leeches from the marshes (about 100-200 kg a year, at £ 40 per kg) (Molnar, in litt., 13.8.86). MAVAD states that many people have stopped collecting leeches because profit is so small (Molnar, in litt., Sept. 1986).

Italy: Four known suppliers. Feliciano has supplied leeches for many years to local hospitals and pharmaceutical companies. These used to be collected from ponds and marshes throughout Italy but are now collected only from southern Italy. Currently supplies about 200 a year to hospitals at L 2,500 each (in 1981, prices were L 5,000 each). Now has difficulties in obtaining specimens (Feliciano, in litt., 18.8.86). Oriano used to supply locally collected leeches for eye treatments at L 1,500 each (Oriano, in litt., 10.10.81).

Norway: No commercial collecting (Solem, in litt., 10.9.86).

Romania: No local use (Bacescu, in litt., 6.8.86).

Spain: No known local use (Molinas, in litt., 21.7.86).

Sweden: No known local use or collection.

Switzerland: No information on locally collected specimens.

Turkey: Collected in large numbers for centuries (Nell, in litt., 6.10.81).

UK: No known local collection.

32. Legal International Trade: Enormous numbers of leeches were in trade in the 19th century for medicinal purposes. Records of tax imposition on leeches imported into France allow an estimate of over 1,000,000,000 leeches imported during the last century. Similar unrecorded trade occurred in other European countries. Recently the harvest is said to be in the order of hundreds of thousands of leeches a year (Fink, 1984).

The Medicinal leech is now of particular interest for the large number of medically useful substances which have been isolated (Seemüller et al., 1980; Snider et al., 198?; Dodt et al., 1985; Petersen et al., 1976; Bode et al., 1986). These include;

1. Hirudin: a non-enzymatic polypeptide which prevents the coagulation of blood via specific anti-thrombic activity.

2. Histamine: a vasodilator which increases blood flow during feeding.

3. Hyaluronidase: a B-endoglucuronidase spreading factor which hydrolyzes the internal glucuronidic bonds of hyaluronic acid. Its mechanism of action is different from existing hyaluronidases from animal (bovine or ovine testicular tissue) and bacterial sources.

4. Bdellins: proteolytic inhibitors with anti-typsin/plasmin/acrosin activity.

5. Eglins: proteolytic inhibitors with anti-chymotrypsin/elastase activity. Both bdellins and eglins are the basis of the anti-inflammatory response following a leech bite. Eglins have now been genetically engineered and patented by Ciba-Geigy A.G. and Plantorgan.

6. Anaesthetic: the substance has never been isolated nor characterized but the leech bite is absolutely painless.

7. Plasminogen-activator: prevents the coagulation of blood by activating the body's natural plasminogen system. This property is common to a number of bloodsucking animals and is the basis of the currently used anti-coagulants urokinase and streptokinase.

The largest present-day users are major pharmaceutical companies. Many of these supply purified hirudin for use in preparations or as a research tool, each purification requiring thousands of

leech heads although the amount of hirudin available from a leech is very variable. World sales of hirudin in the year to June 1984, were £3.5 million or US$5.1 million MSP (Manufacturers' Selling Price). Of these sales, almost £3.2 million (over 90 %) were in F.R. Germany; the second major consumer is the USA. Annual world sales of hyaluronidase at June 1984 were £8.8 million (but this includes some hyaluronidase derived from mammalian testicular tissue) (Perry, in litt. to Wachtel, 5.11.84). The leech is also used in micro-surgery involving the replacement of severed appendages; the anaesthetic and vasodilator are used to aid the rejoining of severed limbs, and the leech may reduce associated swelling (Henderson et al., 1983; Whitlock et al., 1983.

Medicinal leeches are supplied by the biological supply market for education and research purposes. The main zoological interest is in the neuromuscular co-ordination of swimming and in neuropharmacology (with special reference to neurotransmitter receptors). US universities use about 2,000 leeches a year for neurophysiological research (at about US$ 5-10 each), although total US university demand for live leeches may be as high as 1,500,000 a year (Goldsmith, pers. comm., 1983). Leech muscle may still be used occasionally, for example in Japan, in pharmacological laboratories for acetylcholine assay.

South-eastern Europe is the main supplier of wild-caught leeches (countries involved in the trade are listed below). It has been estimated that 12,000 kg of leeches are involved in the European trade annually (Desbarax, in litt. to Payton, 30.6.81). In eastern Europe, the catching season is March to September. Prices vary as catching is difficult (120 DM per 100 in 1982 plus fringe costs) (Nell, in litt., 6.10.81).

Austria: Leeches are imported from Hungary (Kuhnelt, in litt., 30.9.86).

Belgium: The pharmaceutical company, Belgana (the only company involved in the leech trade) produces 'Hiru-crème', similar to the German product 'Exhirud' from leeches. They import 30 litres of hirudin extract annually from a mother company, Nicolas Ana, in France. The leeches used to originate in Hungary. Demand for leech extract in Belgium is growing but it is difficult to obtain (d'Huart, in litt., 10.9.84).

Canada: Available in Chinese areas (Davis, in litt., 29.7.86) as dry or living specimens, believed to be imported from Portugal, and used in large numbers in Calgary and other high density Chinese areas, such as Vancouver. Also used in hospitals, and for research.

Denmark: There is one trading company, Mecobenzon, which imports 100 live specimens a year to resell to pharmacies, schools and universities (Baagoe, in litt., 24.7.86). One Norwegian company imports leeches from Denmark (Solem, in litt., 10.9.86).

France: RICARIMPEX, one of the main suppliers, exports 30-50 litres of extract annually to the Swiss firm Pentapharm Dollinger, in litt., 20.6.83) (origin of supplies not clear).

Nicolas Ana imports live specimens from Hungary to produce extracts, and exports 30 litres a year to Belgium. R. Brookes & Co., UK, reports importing live specimens from France.

F.R. Germany: 4 suppliers known, of which E. Nell is the largest, having supplied leeches for many years. These are obtained from Hungary, Yugoslavia, Greece and Turkey. Cost of dispatch is high and leeches are therefore only viable in large quantities (Nell, in litt., 6.10.81). They handle 1,000,000 leeches a year for hirudin extraction and an additional 200,000 are used in F.R. Germany for other purposes.

The pharmaceutical company Plantorgan Werk AG is the main consumer of leeches in Germany, and also probably the largest consumer in Europe. It produces three products containing hirudin for the German market: 'Exhirud Gel' for the treatment of thrombosis, thrombophlebitis, tendovaginitus, contusions, busitus and juvenile acne [£ 2,137,000 Manufacturers Selling Price (MSP) June 1984]; 'Haemo-exhirud, for haemorrhoids (£ 683,000 MSP June 1984); and 'Dolo-exhirud' for rheumatism (£ 356,000 MSP June 1984). In 1984 sales of hirudin in F.R. Germany rose by 17 % compared with a world market growth of 7 % (Perry, in litt. to Wachtel, 5.11.84). In 1984 Plantorgan Werk's main sources were reported to be Greece, Hungary, Turkey and Yugoslavia (Fink, 1984).

Greece: Protected in 1980, but reportedly exported to F.R. Germany (Nell, in litt., 6.10.81) and believed to be a major source for Plantorgan Werk (Fink, 1984).

Hungary: Large numbers were exported to F.R. Germany in 1981 (Nell, in litt., 6.10.81), and Hungary was a major source for Plantorgan Werk in 1984 (Fink, 1984). According to dealers in Austria, practically all of the leeches available there come from the Plattensee in Hungary (Kuhnelt, in litt., 30.9.86). Two companies are known. According to the main one, they used to export to F.R. Germany and Switzerland (Molnar, in litt., Sept. 1986).

Italy: 4 suppliers known. Feliciano once imported from Switzerland and Poland, but now supplies only locally caught leeches (in litt., 18.8.86). Grassi Oriano used to import from Yugoslavia (in litt., 10.10.81) but now imports from Hungary and sells about 20,000 leeches a year to France, Switzerland, UK and USA. In 1981 the leeches were sold at L 1,500 each but now they cost L 1,000 each (Oriano, in litt., 10.10.1981 and 4.11.86). R. Brookes & Co., UK, import some of their 5,000 live leeches from Italy.

Poland: Leeches were once exported to France (Jazdzewska, 1983); and more recently to Italy (Feliciano, in litt., 18.8.86).

Portugal: Believed to be a source of leeches sold in Canada, although there are no recent records of this species in the country.

Romania: Not exploited according to Bacescu (in litt., 6.8.86).

Spain: Hirudin, not of Spanish origin, is available in chemist shops. Live specimens are known in one instance to be imported from F.R. Germany for use in "phlebotherapy" (Molinas, in litt., 21.7.86).

Sweden: No commercial trade (Dahm, in litt., 27.8.86).

Switzerland: Feliciano, Italy, used to import from Switzerland (in litt., 18.8.86). The pharmaceutical company Pentapharm (Basle) imports 30-50 litres of hirudin extract from France annually. In 1984, 150 specimens were imported from F.R. Germany (Nell) for use in a university; total expected imports were 400 leeches (Dollinger, in litt., 27.3.84). One product containing hirudin has been registered with the Intercantonal Office for the Registration of Medicaments (Dollinger, in litt. to Rudge, 20.6.83).

Turkey: One company known to sell leeches to hospitals in Europe (Nell, in litt., 6.10.81), and a major source for F.R. Germany (Fink, 1984).

UK: R. Brookes & Co. supplies 5,000 leeches a year, imported from France, Italy and eastern Europe, mainly for use in hospitals and research institutes for dissections and micro-surgery (Lucas, in litt., 20.5.82). Several hospitals in the country were using leeches in 1984 (Cooper, in litt., 8.10.84).

USA: 2 suppliers. Import large numbers for use in hospitals, universities.

Yugoslavia: Reportedly a source of imports to F.R. Germany (Neil, in litt., 6.10.81; Fink, 1984) and Italy (Oriano, in litt., 10.10.81).

33. Illegal Trade: The species is protected in Greece but there is evidence that it is collected for export (Nell, in litt., 6.10.81).

34. Potential Trade Threats: The enormous scale of trade in the last century was associated with the original decline in numbers of Hirudo medicinalis. The species is attracted to men in water so that collection can be very efficient and whole populations may be collected. Given the failure of European populations to recover from this and the renewed use of the species in large but unknown numbers by the pharmaceutical industry, the species may become threatened throughout its range, including those areas where it has up to now been abundant. There are several reports suggesting that it is increasingly difficult to obtain leeches (Niekisch, in litt., 19.10.84). It is estimated by some authorities that hirudin will be synthesised in 10 years, and work is also being done on the culture of secretory cells, but the use of live leeches in plastic surgery is increasing and these can never be replaced by synthetic products. It is recommended therefore that the species be placed in Appendix II of the Convention so that the numbers in trade can be monitored and the rate of loss of numbers from individual populations can be accurately measured.

4. Protection Status

41. National: In the past, Hanover (1823), Austria (1827), Sardinia (1828-30), Spain (1850) and Wallachia all prohibited or otherwise controlled leech exports. Currently protected by Presidential Decree in Greece (1980) and listed on decree for protected animals in Luxembourg. In Bulgaria collecting is forbidden annually from 20 April to 20 May.

    Although no areas are known to have been set aside primarily for the conservation of the leech, the Aiguamolls de l'Emporda National Park in North-West Spain protects a marsh containing a large leech population and there is a stable population in the Coto Doñana Reserve in the South. Kenfig Pool, Wales is within a nature reserve.

42. International: Listed in the IUCN Invertebrate Red Data Book under the category Indeterminate. The species is being considered for listing in Appendix III of the Bern Convention.

43. Additional Protection Needs: Surveys are needed in order to assess the distribution and status of major populations. Effective protection and management programmes should follow.

    Changes in farming methods have contributed to the decline in H. medicinalis through habitat destruction. Loss of marsh land is a major threat since this is also causing a decline in the marsh frog, which is the host of young medicinal leeches (Wells et al., 1983; Fink, 1984). Assessment of changes in land use on population levels are needed to decide what other measures should be taken to safeguard the species.

    Eventually, genetic engineering and captive breeding may obviate the need for wild animals. Both eglins and bdellins have been genetically engineered by Plantorgan and Ciba-Geigy A.G.

5. Information on Similar Species

Species such as Haemopis sanguisuga and the giant Amazonian leech Haementeria ghilianni are increasingly used for educational purposes in schools and universities instead of Hirudo medicinalis. Haementeria ghilianii is being successfully bred in captivity. In Australia, the five-striped leech, Hirudo quinquestriata is used instead of the European variety, and in Canada the American medicinal leech, Macrobdella decora is often used (Davis, in litt., 29.7.86). There is a large market for live and dry leeches in Oriental medicine, but Asian species are mainly used. Studies of the anti-coagulants of Haemodipsa zeylanica, collected in the wild in Borneo, are also under way (Sawyer, in litt., 21.3.82).

Substitution of other Hirundinaria spp. such as the "buffalo" leeches, abundant in Asia, may be possible. An Australian subspecies Hirudo australis bosisto and the European trout leech Hirudo trocincta (sometimes regarded as a subspecies of H. medicinalis) were imported into the United Kingdom instead of H. medicinalis in the 19th century. Some of these species were released in the UK and some populations of trout leech may have survived and be taken for Hirudo medicinalis.

6. Comments from Countries of Origin

This proposal was sent in draft to all countries of origin for comment. Only the following responses have been received:

Italy: The CITES Management Authority in Italy affirms that H. medicinalis requires protection from the threat of depletion by commercial trade and supports this proposal (Bortolotti, in litt., 10.11.86).

Ireland: Ireland supports this proposal as H. medicinalis now seems to be extinct there and there is a need to control trade (T. O'Shaughnessy, Department of Tourism, Fisheries and Forestry, in litt., 22.10.86).

7. Additional Remarks

In the past, the leech was reared in shallow, muddy, vegetated ponds in Poland (Jazdzewska, 1983), France (Gironde), Belgium and Holland (Lameere, 1895; Van der Eijk, 1977), and breeding programmes were attempted in France, Germany and the USA in the 19th century (Wells et al., 1983). Research into captive breeding of H. medicinalis has also been undertaken in the USSR (Wells et al., 1983).

Captive breeding of H. medicinalis has been successful at the Biopharm leech farm, Swansea, UK, which hopes eventually to meet the world demand for leeches. The initial breeding stock of H. medicinalis came from Hungary (MAVAD), F.R. Germany (Nell) and France (Ricarimpex). Other species of leech are also bred and some 30,000 animals are in stock (see below). A total of about 10,000 captive-bred specimens of various species have so far been used in medicine and research. It exports three-quarters of its captive-bred leeches abroad, half going to USA and some to Israel. Its single largest customer is the British National Health Service, since the level of use in hospitals is increasing. It supplies mainly live specimens but some biochemical extracts as well.

However it has been suggested that, for reasons of cost, captive production in the next few years may only enter for teaching, research and direct medical application, i.e. about 100,000 to 200,000 animals a year (Fink, 1984). Fink states that the demand for pharmaceutical use would not be met by captive breeding for 8-10 years.

The supplier MAVAD in Hungary plans to start a major leech rearing project in about two years (Molnar, in litt., 13.8.86).

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