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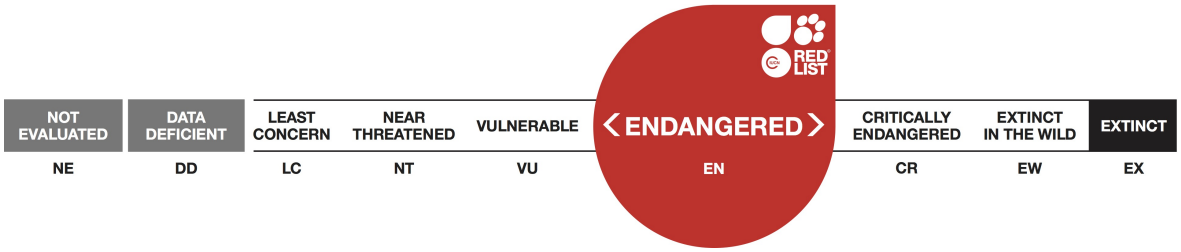
Isurus oxyrinchus, Shortfin Mako

Assessment by: Rigby, C.L. *et al.*



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Lamniformes	Lamnidae

Taxon Name: *Isurus oxyrinchus* Rafinesque, 1810

Regional Assessments:

- Europe
- Mediterranean

Infra-specific Taxa Assessed:

- *Isurus oxyrinchus* (Atlantic subpopulation)
- *Isurus oxyrinchus* (Eastern North Pacific subpopulation)
- *Isurus oxyrinchus* (Indo-west Pacific subpopulation)

Common Name(s):

- English: Shortfin Mako

Taxonomic Source(s):

Rafinesque, C.S. 1810. *Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia, con varie osservazioni sopra i medisimi*. Sanfilippo, Palermo.

Assessment Information

Red List Category & Criteria: Endangered A2bd ver 3.1

Year Published: 2019

Date Assessed: November 5, 2018

Justification:

The Shortfin Mako (*Isurus oxyrinchus*) is a large (to 445 cm total length) pelagic shark, widespread in temperate and tropical oceans to depths of 888 m. The species has low biological productivity with a triennial reproductive cycle and late age at maturity. It is caught globally as target and bycatch in coastal and pelagic commercial and small-scale longline, purse seine, and gillnet fisheries, and is generally retained for the high-value meat as well as its fins. Steep population declines have occurred in the north and south Atlantic, with declines also evident, though not as steep in the north Pacific and Indian Oceans. The south Pacific population appears to be increasing but with fluctuating catch rates. The weighted global population trend estimated a median decline of 46.6%, with the highest probability of 50–79% reduction over three generation lengths (72–75 years), and therefore the Shortfin Mako is assessed as Endangered A2bd.

Previously Published Red List Assessments

2009 – Vulnerable (VU)
http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39341A10207466.en

2000 – Lower Risk/near threatened (LR/nt)

http://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39341A2903170.en

Geographic Range

Range Description:

The Shortfin Mako (*Isurus oxyrnchus*) is widespread in temperate and tropical waters of all oceans (Ebert *et al.* 2013).

Country Occurrence:

Native: Albania; Algeria; American Samoa; Angola; Anguilla; Antigua and Barbuda; Argentina; Aruba; Australia; Bahamas; Bangladesh; Barbados; Belize; Benin; Bermuda; Bonaire, Sint Eustatius and Saba; Brazil; Brunei Darussalam; Cabo Verde; Cambodia; Cameroon; Canada; Cayman Islands; Chile (Easter Is.); China; Christmas Island; Cocos (Keeling) Islands; Colombia; Congo; Cook Islands; Costa Rica; Côte d'Ivoire; Croatia; Cuba; Curaçao; Cyprus; Dominica; Dominican Republic; Ecuador (Ecuador (mainland), Galápagos); Egypt; El Salvador; Equatorial Guinea (Annobón, Equatorial Guinea (mainland)); Eritrea; Fiji; France (Clipperton I., France (mainland)); French Guiana; French Polynesia; Gabon; Gambia; Ghana; Gibraltar; Greece; Grenada; Guadeloupe; Guam; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; India (Andaman Is., Nicobar Is.); Indonesia; Iran, Islamic Republic of; Ireland; Israel; Italy; Jamaica; Japan; Kenya; Kiribati; Korea, Democratic People's Republic of; Korea, Republic of; Liberia; Libya; Macao; Madagascar; Malaysia; Maldives; Malta; Marshall Islands; Martinique; Mauritania; Mauritius; Mexico; Micronesia, Federated States of ; Montenegro; Montserrat; Morocco; Mozambique; Myanmar; Namibia; Nauru; New Caledonia; New Zealand; Nicaragua; Nigeria; Niue; Norfolk Island; Northern Mariana Islands; Norway; Oman; Pakistan; Palau; Panama; Papua New Guinea; Peru; Philippines; Pitcairn; Portugal (Azores, Madeira, Portugal (mainland), Selvagens); Puerto Rico (Navassa I., Puerto Rico (main island)); Réunion; Russian Federation; Saint Barthélemy; Saint Helena, Ascension and Tristan da Cunha; Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Samoa; Sao Tome and Principe; Saudi Arabia; Senegal; Seychelles; Sierra Leone; Singapore; Sint Maarten (Dutch part); Solomon Islands; Somalia; South Africa; Spain (Canary Is., Spain (mainland), Spanish North African Territories); Sri Lanka; Sudan; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Tokelau; Tonga; Trinidad and Tobago; Tunisia; Turkey; Turks and Caicos Islands; Tuvalu; United Kingdom; United States (Aleutian Is., Hawaiian Is.); United States Minor Outlying Islands (Howland-Baker Is., Johnston I., Midway Is., US Line Is., Wake Is.); Uruguay; Vanuatu; Venezuela, Bolivarian Republic of (Venezuela (mainland), Venezuelan Antilles); Viet Nam; Virgin Islands, British; Virgin Islands, U.S.; Wallis and Futuna; Western Sahara; Yemen

FAO Marine Fishing Areas:

Native: Atlantic - northwest, Atlantic - southeast, Atlantic - southwest, Atlantic - eastern central, Atlantic - northeast, Atlantic - western central, Indian Ocean - eastern, Indian Ocean - western, Mediterranean and Black Sea - , Pacific - northeast, Pacific - southwest, Pacific - western central, Pacific - southeast, Pacific - eastern central, Pacific - northwest

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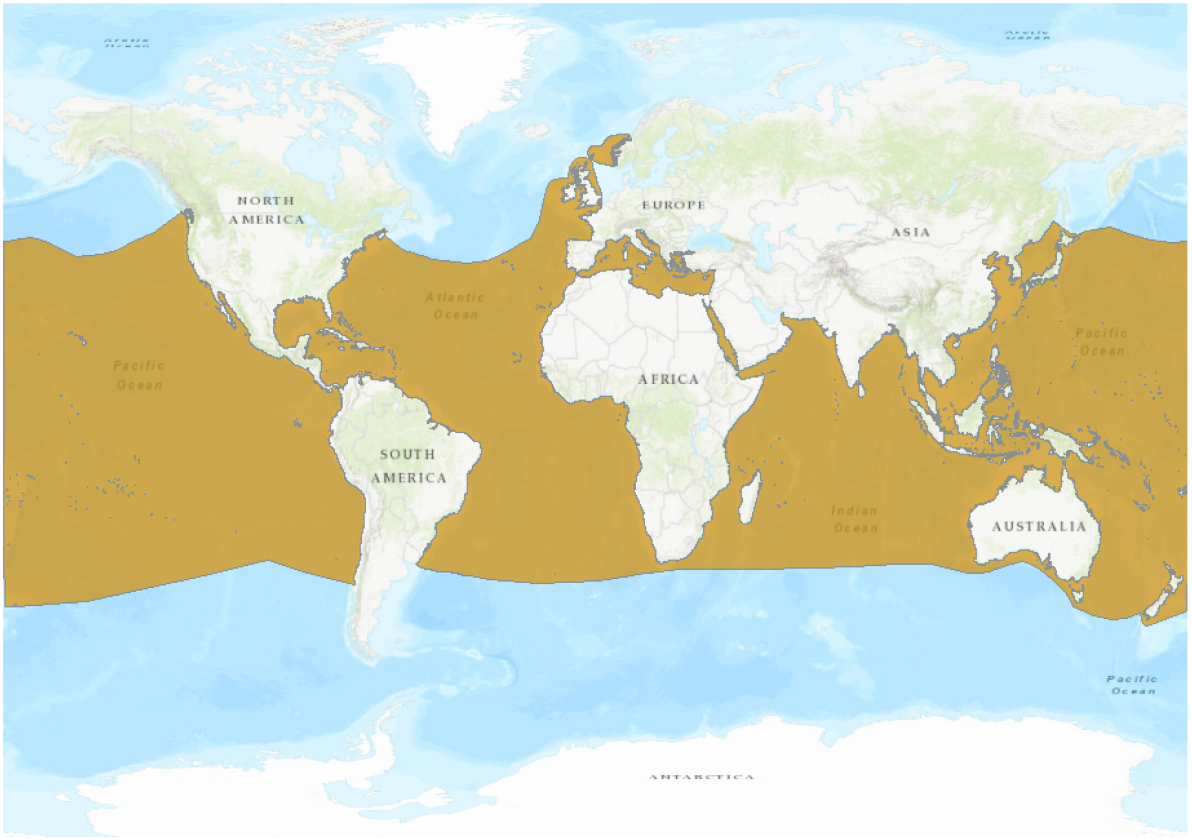
Distribution Map

Isurus oxyrinchus



0 7,200

Kilometer

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

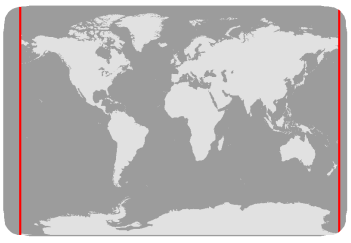
Range

Extant (resident)

Compiled by:

IUCN SSC Shark Specialist Group

NE DD LC NT VU **EN** ENDANGERED CR EW EX



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

There are no data available on the absolute global population size of the Shortfin Mako. Genetic results indicate one global population, however there is some genetic structuring between ocean basins (Schrey and Heist 2003, Taguchi *et al*. 2015, Corrigan *et al*. 2018).

Population trend data are available from four sources: (1) stock assessments in the north Atlantic and south Atlantic (ICCAT 2017); (2) stock assessment in the north Pacific (ISC 2018); (3) standardized catch-per-unit-effort (CPUE) in the south Pacific (Francis *et al*. 2014); and (4) a preliminary stock assessment in the Indian Ocean (Brunel *et al*. 2018). The trend data from each source were analysed over three generation lengths using a Bayesian state-space framework (a modification of Winker *et al*. 2018). This analysis yields an annual rate of change, a median change over three generation lengths, and the probability of the most likely IUCN Red List category percent change over three generations (see the Supplementary Information).

First, while the previous north Atlantic stock assessment suggested low probability of overfishing and that stocks were healthy (ICCAT 2012), the most recent north Atlantic stock assessment revealed that the stock was both overfished and that overfishing was occurring (ICCAT 2017). The south Atlantic stock assessment biomass estimates were deemed unreliable by the stock assessors, although they inferred that fishing mortality is likely unsustainable (ICCAT 2017). This concern is corroborated by a recent analysis of standardized catch rates of Shortfin Mako on longlines in the south Atlantic that revealed steep declines of 99% in the average CPUE of 1979–1997 and 1998–2007 (Barreto *et al*. 2016a). As a result of the unreliable stock assessment, the north Atlantic stock assessment was considered as representative of the south Atlantic for the trend analysis. The trend analysis of the north Atlantic modelled biomass for 1950–2017 (68 years) revealed annual rates of decline of 1.2%, consistent with an estimated median decline of 60.0% over three generation lengths (75 years), with the highest probability of 50–79% reduction over three generation lengths.

Second, the north Pacific stock assessment revealed that the stock was likely not overfished and that overfishing was likely not occurring (ISC 2018). The trend analysis of the modelled spawning abundance for 1975–2016 (42 years) revealed annual rates of decline of 0.6%, consistent with a median decline of 36.5% over three generation lengths (72 years), with the highest probability of 30–49% reduction over three generation lengths. Although the stock assessment used a long data time series of 40 years, the trend analysis considered the population change over a longer period of 72 years, which results in a greater decline than that of the stock assessment.

Third, the New Zealand longline observer Shortfin Mako standardized CPUE for 1995–2013 (19 years) (Francis *et al*. 2014) was used to represent the catches in that region as it is observer data with good coverage, comes from the part of the region with highest catch rates, and Shortfin Mako move between New Zealand waters and areas further north. The trend analysis indicated annual rates of increase of 0.5%, consistent with a median increase of 35.2% over three generation lengths (72 years), with the highest probability of an increasing population over three generation lengths.

Fourth, the Indian Ocean preliminary stock assessment indicated that the Shortfin Mako stock is not currently overfished but subject to overfishing, however the biomass trajectories trend towards overfished with overfishing status (Brunel *et al*. 2018). The trend analysis of the biomass for 1971–2015

(45 years) revealed annual rates of decline of 0.9%, consistent with a median decline of 47.9% over three generation lengths (72 years), with the highest probability of 30–49% reduction over three generation lengths.

Further to the above data and trend analyses, steep declines have occurred in the Mediterranean Sea; Ferretti *et al*. (2008) compiled nine time series of abundance indices from commercial and recreational fishery landings, scientific surveys, and sighting records, to reconstruct long-term population trends of large sharks in the northwestern Mediterranean Sea. Shortfin Mako and Porbeagle (*Lamna nasus*) showed an average instantaneous rate of decline in abundance of -0.12 (time range 135 years) and biomass of -0.15 (time range 106 years), which equates to an estimated decline of 99.9% in abundance and biomass since the early 19th century (Ferreti *et al*. 2008).

Across the regions, the Shortfin Mako was estimated to be declining in all oceans, other than the south Pacific where it is increasing. To estimate a global population trend, the estimated three generation population trends for each region were weighted according to the relative size of each region. The overall estimated median reduction was 46.6%, with the highest probability of 50–79% reduction over three generation lengths (72–75 years), and therefore the species is assessed as Endangered A2.

For further information about this species, see Supplementary Material.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The Shortfin Mako is a neritic and oceanic, epipelagic and mesopelagic species, found worldwide in tropical and warm-temperate seas to depths of 888 m (Abascal *et al.* 2011, Ebert *et al.* 2013, Weigmann 2016). The species reaches a maximum size of about 445 cm total length (TL) (Weigmann 2016). Males mature at 166–204 cm TL and females at 265–312 cm TL (Pratt and Casey 1983, Stevens 1983, Cliff *et al.* 1990, Francis and Duffy 2005, Varghese *et al.* 2017). Reproduction is viviparous and oophagous with an estimated gestation period of 15–18 months and a three-year reproductive cycle (Mollet and Cailliet 2002). Litter size is 4–25 pups (possibly up to 30, mostly 10–18) with a size at birth of 60–70 cm TL (Garrick 1967, Compagno 2001). Female age at maturity varies from 18–21 years and maximum age from 28–32 years in New Zealand, the Southwest Pacific, Southwest Atlantic, and Northwest Atlantic Oceans; generation length is therefore 24–25 years (Bishop *et al.* 2006, Natanson *et al.* 2006, Wells *et al.* 2013, Doño *et al.* 2014, Barreto *et al.* 2016b).

Systems: Marine

Use and Trade

This is one of the most valuable shark species due to its high-quality meat. The meat is utilized fresh, frozen, smoked, and dried-salted for human consumption. The fins of the Shortfin Mako are commonly traded, comprising 1.2% of the fin imported in Hong Kong in 2014 (Fields *et al.* 2017). The liver oil, jaws, and skin are also used (Compagno 2001).

Threats (see Appendix for additional information)

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The Shortfin Mako is caught globally as target and bycatch in pelagic commercial and small-scale longline, purse seine, and gillnet fisheries. The majority of the catch is taken as bycatch of industrial pelagic fleets in offshore and high-seas waters (Camhi *et al.* 2008). It is also captured in coastal longlines, gillnets, trammel nets, and sometimes trawls, particularly in areas with narrow continental shelves (Camhi *et al.* 2008, Martínez-Ortiz *et al.* 2015).

The species is generally retained for the meat and fins (Clarke *et al.* 2006a*,* Clarke *et al.* 2006b, Dent and Clarke 2015*,* Fields *et al.* 2017), unless regulations prohibit retention. Under-reporting of catches is likely in pelagic and domestic fisheries (Dent and Clarke 2015, Campana *et al*. 2016a). The species is highly valued by big-game recreational fishers, and although many practice catch and release, recreational fishing could be a threat due to post-release mortality, although such mortality is reported at 10% for recreational fishing (Camhi *et al.* 2008, French *et al.* 2015). Commercial post-release mortality has been reported as 30–33% for the Shortfin Mako on longlines (Campana *et al.* 2016b). The species is taken in beach protection programs that target large sharks (Dudley and Simpfendorfer 2006, Simpfendorfer *et al.* 2010, Reid *et al.* 2011).

Conservation Actions **(see Appendix for additional information)**

The success of actions agreed through international wildlife and fisheries treaties depends on implementation at the domestic level; for sharks, such follow up actions have to date been seriously lacking. In 2008, the Shortfin Mako was listed on Appendix II of the Convention on Migratory Species (CMS), which reflects Parties' commitments to work regionally toward conservation. The species is also covered by the CMS Memorandum of Understanding for Migratory Sharks, which is aimed at facilitating conservation. In 2018, Mexico announced its intention to propose adding the Shortfin Mako to Appendix II of the Convention on International Trade in Endangered Species (CITES). If the proposal is adopted at the 2019 CITES Conference, Shortfin Mako exports from CITES Parties would need to be accompanied by permits based on findings that parts are sourced from legal and sustainable fisheries.

Globally, there are very few limits on Shortfin Mako catch. In 2012, the General Fisheries Commission for the Mediterranean (GFCM) banned retention and mandated careful release for the Shortfin Mako and 23 other elasmobranch species listed on the Barcelona Convention Annex II. Implementation by GFCM Parties, however, has been very slow. Whereas the European Union implemented this measure through domestic regulations, it has yet to limit Shortfin Mako catch from anywhere else, even as Spain is consistently the world's top Shortfin Mako fishing nation. A 2017 measure agreed by the International Commission for the Conservation of Atlantic Tunas (ICCAT) – in response to scientific advice to ban retention of overfished north Atlantic Shortfin Makos – instead aims to maximize live release by narrowing the conditions under which Shortfin Makos from this population can be landed.

To allow recovery, it is recommended Shortfin Mako landings be prohibited as long as the global population is classified as Endangered. Short of that, improved reporting of catch and discard data, regional and national limits on Shortfin Mako catch based on scientific advice and/or the precautionary approach, and promotion of safe release protocols are urgently needed, as is full implementation of additional commitments agreed through international treaties.

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Credits

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Reviewer(s): Simpfendorfer, C., Dulvy, N.K. & Kyne, P.M.

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Facilitators(s) and Compiler(s): Rigby, C.L., Kyne, P.M., Pollom, R., Herman, K. & Dulvy, N.K.

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: No
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: No
Occur in at least one PA: Yes

Conservation Actions in Place
Area based regional management plan: No
Invasive species control or prevention: Not Applicable
In-Place Species Management
Harvest management plan: No
Successfully reintroduced or introduced beningly: No
Subject to ex-situ conservation: No
In-Place Education
Subject to recent education and awareness programmes: No
Included in international legislation: No
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends

Additional Data Fields

Distribution
Lower depth limit (m): 888

http://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39341A2903170.en

Distribution
Upper depth limit (m): 0
Habitats and Ecology
Generation Length (years): 24-25

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.