

Feature Environment

Micropropagation can Turn the Country Greener

OUT of 16 per cent of the land under afforestation programme 9 per cent is under government management and in the remaining 7 per cent there is hardly any plant cover. The latter is classified as Unclassified State Forest (UCSF). Due to a rapid explosion of population the actual tree cover has been reduced to only 6 per cent. In certain areas such as in Sal (Shorea robusta) forest the situation is devastating. Out of 95,000 hectare of Sal forest in Dhaka, Madhupur, Dinajpur, Tangail, nearly 71,000 ha. have been denuded.

great demand both within the country and as an export item. There is a rapid decline in the number of 'khoer' trees. It may be mentioned here that in order to extract 'khoer', the whole tree is felled and cut into small chips. 'Khoer' is extracted from these chips by distillation process. Since this is a tree species of the northern arid zone, more emphasis should be given for multiplying the species and planting them to cover the depleted zone. Micropropagation through tissue culture may solve this problem.

Eucalyptus camendulensis
There is some controversy about the usefulness of this tree species in the context of Bangladesh. However, it has been established that except that this species consumes a lot of water and draws it from the underground source, it is otherwise suitable. It can therefore be planted in areas where water scarcity is not a problem. However seeds of this species are in short supply and cannot meet the present demand of the Forest Department. Protocol for micropropagation of Eucalyptus is well known and has been devised at the Indian Chemical Institute, Pune.

Pinus caribaea
It is a tropical pine tree and as the name suggests its country of origin is in the Caribbean region. It is a fast growing pine tree but due to lack of seeds it cannot be planted in large areas. This is a problem of micropropagation which has to be overcome through systematic research. Once solved this beautiful fast growing tree can be used to improve our landscape as well as provide valuable timber when they will be ready for felling.

Gamari (Gmelina arborea)
It is a good timber tree but before it is ready for lumbering, several parasite species of loranthaceae take a heavy toll of this species. This fact has discouraged the Forest Department for planting this species on a large scale. Here is a problem of basic research on the necessity of developing 'gamari' variety resistant to the attack of loyathes species.

Garjan (Dipterocarpus turbinatus)
It is a valuable timber tree. It is like teak in its usefulness. In spite of this, no nursery has so far been established for multiplying this species. As a result saplings are in short supply and fall far below the requirement of the Forest Department. Micropropagation of 'garjan' might solve this problem.

Chapalis (Atrocarpus chapalis)
A useful timber tree is rapidly declining in Sylhet, Chittagong, Chittagong Hill Tracts, mainly due to non-availability of seeds. To restore this species to its original level, micropropagation of this tree species will be most useful.

Michelia champa
It is a valuable timber tree with very fragrant flowers. This species is declining at an alarming rate. Preservation of this species through its micropropagation will be a good solution for saving this species.

Irion tree (Xylia delabrieformis)
This tree species, introduced from Burma, is a highly prized species. Its name is derived from its colour and strength. Because of its uninterrupted height, it is used in the production of slipper, transmission pole. The main constraint in the way of its plantation is lack of seeds and saplings. FRI (Forest Research Institute) can initiate a project on its micropropagation.

Bamboo
In its look bamboo is unique and characteristically different from rest of the plants. Both village and city dwellers value this plant greatly for its usefulness. People use bamboo to construct mudpasted walls for their cottages, fences, improvised bridges, fixed benches on roadsides, scaffolding around buildings during construction, as a prop to set 'Shamiana' and temporary stage to make sitting places inside boats and for different other purposes. The following table gives the figure of the number of bamboos produced during the year 1987-88 and its approximate cost.

Number of bamboo (000)	Cost (000 Tk.)
1,05,050	5,00,000

After World War II bamboo became a very important ingredient in the paper manufacturing industry. Bamboo pulp, when used as an ingredient, improves the quality of paper.

Because of abundance of bamboo forest, a paper mill was set up at Chandraghona on the bank of the Karnafull river.

In order to supply the raw material to keep the paper mill going, bamboo forests were indiscriminately felled so much so that bamboo forests have been depleted. The natural growth of bamboo could not keep pace with the demand of the paper mill and human settlements that have grown around the forest area.

How do we solve the problem of replenishing bamboo forests to preparation level? Before we consider this issue, a brief mention of the reproductive behaviour of this interesting plant should be made.

Flowering of bamboo species and problem of afforestation

Bamboo species flower only once in its life time and that also after it grows for a period of 30 to 33 years. Therefore the only way to multiply it will be propagating it vegetatively by means of its axillary buds and nodal cuttings. However, the process is not fast enough to supply seedlings in quantities sufficient for reforestation.

Biotechnological approach
For the first time Mohan Ram at the Department of Botany, Delhi University, India, succeeded in multiplying bamboo species through tissue culture.

Working under the supervision of Professor S. Hadiuzzaman, Department of Botany, Dhaka University, Dr. Ratan Lal Banik, Forest Research Institute, Chittagong, completed investigation for his Ph.D on the propagation of eighteen bamboo species. Using auxiliary buds at the nodal region also called 'eye buds', he successfully micropropagated two species of bamboo, namely, Bambusa baluca and Moluccana caecifera ('Muli' bamboo). The technique, they developed by modifying MS, gave them numerous multiple shoots of the above two species. With a little more refinement and modification, this technology can be transferred at the field level for producing bamboo seedlings in quantities that will be required to fill in the depleted bamboo forest areas and planting bamboos in vacant areas of the forest.

Neem (Azadirachta indica)
Neem is a popular tree species. It is not only valued for its hard and durable timber, but it is also an important constituent of some pharmaceutical and insecticidal products. Nimbidin — one of many 'Margarosa' oil compounds, extracted from its seeds, is used in face powder, hair lotion, soap and tooth paste. It is evergreen and planted as an avenue tree particularly in areas where there is scanty or hardly rainfall. In Saudi Arabia now a big plantation of 'neem' trees, planted at the suggestion of late Ziaur Rahman is a pleasing greenery in the 'Hajj' in the midst of the vast desert. It is said that the houses where 'neem' trees stand in the courtyard and around their boundary are safe from snakes possibly because of the volatile ingredients present in the 'neem'. It acts as repellents against insects and snakes. Tender 'neem' leaves are considered as delicacies when cooked with other vegetables. Pills made by powder by grinding neem leaves are used successfully for the treatment of eczema and various other skin diseases.

This valuable evergreen timber tree which hardly needs any water for its maintenance after its plantation is ideally suited for afforestation in the vast tracts of arid land in the northern region of Bangladesh called 'Barendra'.

This is an urgent need of the country in order to stop the desertification process which is turning a sizeable portion of fertile land of 'Barendra' barren every year.

Lack of dormancy of 'neem' seeds
One great difficulty about raising 'neem' saplings for afforestation is that 'neem' seeds have no dormancy period. The seeds must be planted within seven days after the fruits are ripe and drop on the ground.

This is really a genuine obstacle in raising 'neem' saplings in sufficient quantities to cover 'Barendra' land for afforestation.

A solution
Micropropagation of 'neem' trees may provide an effective solution for this purpose. Once the protocol is established, production of seedlings from the selected neem trees could continue throughout the year.

Recently some scientists in the Botany Department, Rajshahi University, headed by Professor O.I. Joarder worked out the full protocol to produce 'neem' sapling in huge number through application of tissue culture. Using auxin and cytokinin they obtained literally hundreds of somatic embryos both on the surface of cotyledons and hypocotyledons within a period of four weeks. They removed these adventitious

embryos simply by placing the embryoladen cotyledons/hypocotyledons in a test tube of water and forced them out simply by shaking. These (somatic) embryos germinated easily on basal medium supplemented only with 0.1 mg/l BAP. To obtain regenerants (plantlets) via callus, these scientists found LS medium more suitable, the supplements used being the same.

In view of this technology available right within the country, full scale efforts should be directed towards, further refining this technique so that sufficient tree saplings could be made available for afforestation programme in the immediate future. NBI can come forward to help the scientists of Rajshahi University to perfect the technique of micropropagation.

Additional advantage of tissue culture
Tissue culture will provide one more advantage. We can select elite trees, trees with all the desired characteristics and use cotyledonary/hypocotyledonary explants for production of somatic embryos of superior quality.

Superior quality 'neem' seedlings have got great export potentiality to countries like Australia and Middle East countries. In fact, the former is interested to import 'neem' seedlings at a cost A \$7 per sapling. Perfection of tissue culture technique will therefore, on the one hand, provide enough seedlings for the forest in the 'Barendra' tract and, on the other, open up immense possibility of exporting surplus seedlings to countries like Australia and Saudi Arabia.

Bel
'Bel' (Aegle marmelos) one of the minor deciduous fruit trees in valued both for its wood and medicinal properties. Patients suffering from dysentery get immediate relief by eating its fruits regularly. In India, a drug made out of the constituents of this fruit is sold under the trade name 'quinobel' and prescribed by physicians as an effective remedy for stomach ailments.

This tree species is extremely drought-resistant. It is considered almost as important as 'neem' tree for afforestation in arid and semi-arid regions such as found in the northern region of Bangladesh.

It is a highly cross-pollinated plant and as such quantitative plant characters, particularly the fruit size and weight vary a good deal from place to place. In 'Barendra' region fruits of 'bel' tree have been reported to weigh as much as 10-12 kg. Because of strong heterozygosity the majority of plants raised from seeds of quality plants perform poorly. For instance the seeds from superior trees bearing large fruits produce saplings with small fruits weighing only one kg. Root cutting is one way of multiplying it vegetatively but it is not economic considering time and labour that go into this process.

Coconut and Betelnut
An ambitious scheme to cover the coastal zone from Cox's Bazar to Barisal has been recently undertaken with the financial support of Asian Development Bank (ADB). Coconut and betelnut trees will be planted in an area of about 90,000 ha. Involving a cost of Tk 1350 million. About 200 million coconut and betelnut plants will be necessary for the implementation of this project. Since micropropagation of coconut tree is well known, elite plants for this afforestation programme can be had through the process. It is needless to say that quality coconut trees for the coastal belt will provide a good deal of benefit to the country not only in providing protection against tidal waves but also as a potent source of good quality nutritious coconut milk as well as coconut oil.

Savants Heat up Discussions on global warming

ONE thing scientists are now sure of: nothing is definite. If that seems contradictory, scientists can be forgiven for nothing is as fickle as the weather.

But scientists are agreed that if global climate does change, it will strongly affect agriculture — among other things. It's just that they still don't know exactly how.

Forecasting sea-level rise — one effect of a climate change — is also an extremely inexact science today.

In April, some of the world's top scientists will meet here to discuss the so-called Climate Agenda: the issues of global warming, sea-level rise and resulting

called for a programme to determine future climate changes and variability and the implications for human activities.

This time around, scientists will look at ways of strengthening national and regional capacities for monitoring of climate system and early detection of climate change. They will also look at improved application of climate information especially against drought and desertification.

The Geneva meeting will look at promising prediction methods and ways to reduce the uncertainties about climate, better determination of greenhouse gas sources and the transfer of technologies in prediction and research.

are expected to increase more near the poles. Crops for which temperature is the limiting factor may experience longer growing seasons. For example, in the Canadian prairies, the growing season might lengthen by 10 days for every 1 degree Celsius increase in average annual temperature.

But a warmer climate might also interfere with germination or with other key stages in the life cycle of some plants. It might also reduce soil moisture — evaporation rates increase in mid-latitude by about 5 per cent for each 1 degree Celsius rise in average annual temperature.

While scientists are relatively confident that climate change will lead to higher temperatures, they are less sure of how it will impact precipitation — the key constraint on low-altitude and tropical agriculture. Computer models suggest the monsoon may move poleward. The greatest risks for low-altitude countries are that reduced rainfall and soil moisture will damage crops in semiarid regions. Additional heat stress may also damage crops and especially livestock in humid tropical regions.

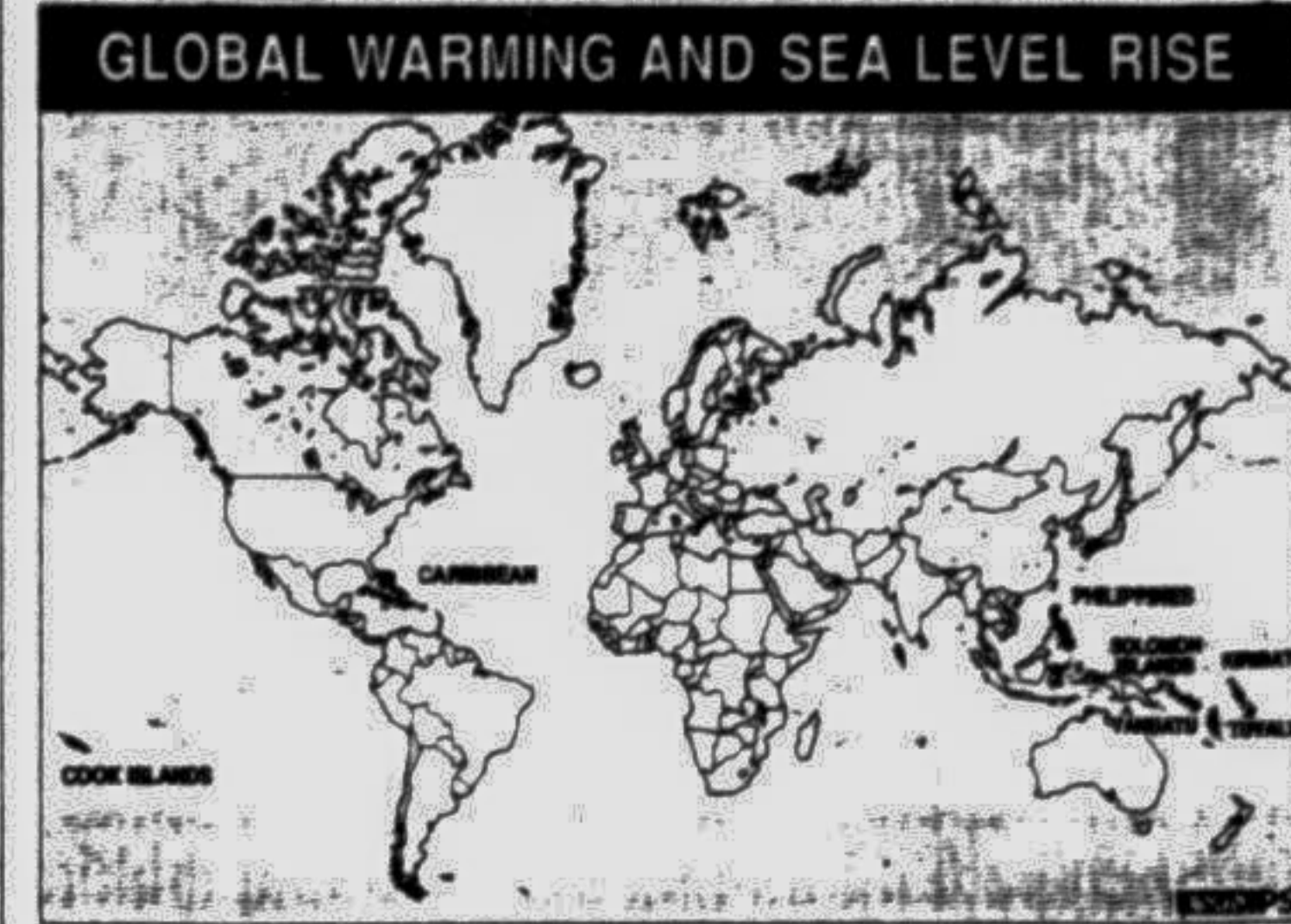
Scientists believe the global mean sea-level may have already risen by 1 to 2 centimeters during the past 100 years. Climate change is expected to cause a further rise of 30 to 50 centimeters by the year 2050.

Global warming would cause the sea to rise in two ways: through thermal expansion of ocean water and through discharges of freshwater from melting ice caps and mountain glaciers.

Rising seas would threaten the viability of freshwater aquifers and sources of fresh groundwater. Coastal farming would be threatened by floods, freshwater shortages and salt damage. In Indonesia, for example, agricultural settlements in marshy areas close to the coast would be highly sensitive to small shifts in ocean levels. Floods, storms and tropical cyclones might worsen. Countries already prone to devastating floods, such as low-lying Bangladesh, would be most affected.

Still, scientists agree that forecasting sea-level rise remains an extremely inexact science. For example, although both thermal expansion of oceans and melt-water from ice caps would cause the sea to rise, computer models indicate there will be increased snow accumulation in Antarctica, which may help moderate the net sea-level rise. — Depthnews

Global warming will raise sea-levels, amplify extreme weather events like storms and hot spells, shift climate zones towards the earth's poles and reduce soil moisture



changes in availability of freshwater resources and the threat to agricultural production.

The scientists will meet during the Intergovernmental Meeting on the World Climate Programme to be convened by the World Meteorological Organisation (WMO), UN Environment Programme (UNEP), Food and Agriculture Organisation (FAO), UN Educational, Scientific and Cultural Organisation (UNESCO), Intergovernmental Oceanographic Organisation (IOC) and the International Council of Scientific Unions (ICSU).

The meeting will review national programmes and assess changing demands on the World Climate Programme (WCP) which measures and studies the global climate system and the factors which affect it. The WCP is an offshoot of the first World Climate Conference in 1979 which

Today, most studies on the agricultural impact of a climate change are based on computer models. These models indicate that a doubling of atmospheric concentrations of carbon dioxide by the year 2030 will increase the average global temperature by 1 to 3 degrees Celsius. It will raise sea-levels, amplify extreme weather events like storms and hot spells, shift climate zones towards the earth's poles and reduce soil moisture.

Scientists generally agree that increased concentrations of carbon dioxide may boost crop productivity. In principle, higher levels of carbon dioxide should stimulate photosynthesis in plants. A doubling of carbon dioxide may increase photosynthesis rates by as much as 30 to 100 per cent.

Climate and agricultural zones would tend to shift towards the poles. This is because average temperatures

Chile Plays along with Japan on Whale Hunting

by Luis Tricot from Santiago

IT is estimated that over a million whales have been killed in the southern hemisphere throughout this century. As a result of such indiscriminate exploitation, seven of the eight surviving species are on the verge of extinction. Even so, the moratorium on whale hunting established seven years ago, and supported by 38 nations, is in serious danger of being lifted this year.

There are only 200 white whales left out of an original population of 50,000, between Peru and the Antarctic. Hence the importance of the Latin

try. It ended in 1979 with a little known ecological crime that had profound international repercussions. The military dictatorship quit the IWC. As the Commission rules were no longer binding on Chile, the government allowed Japan to hunt freely in its territorial waters.

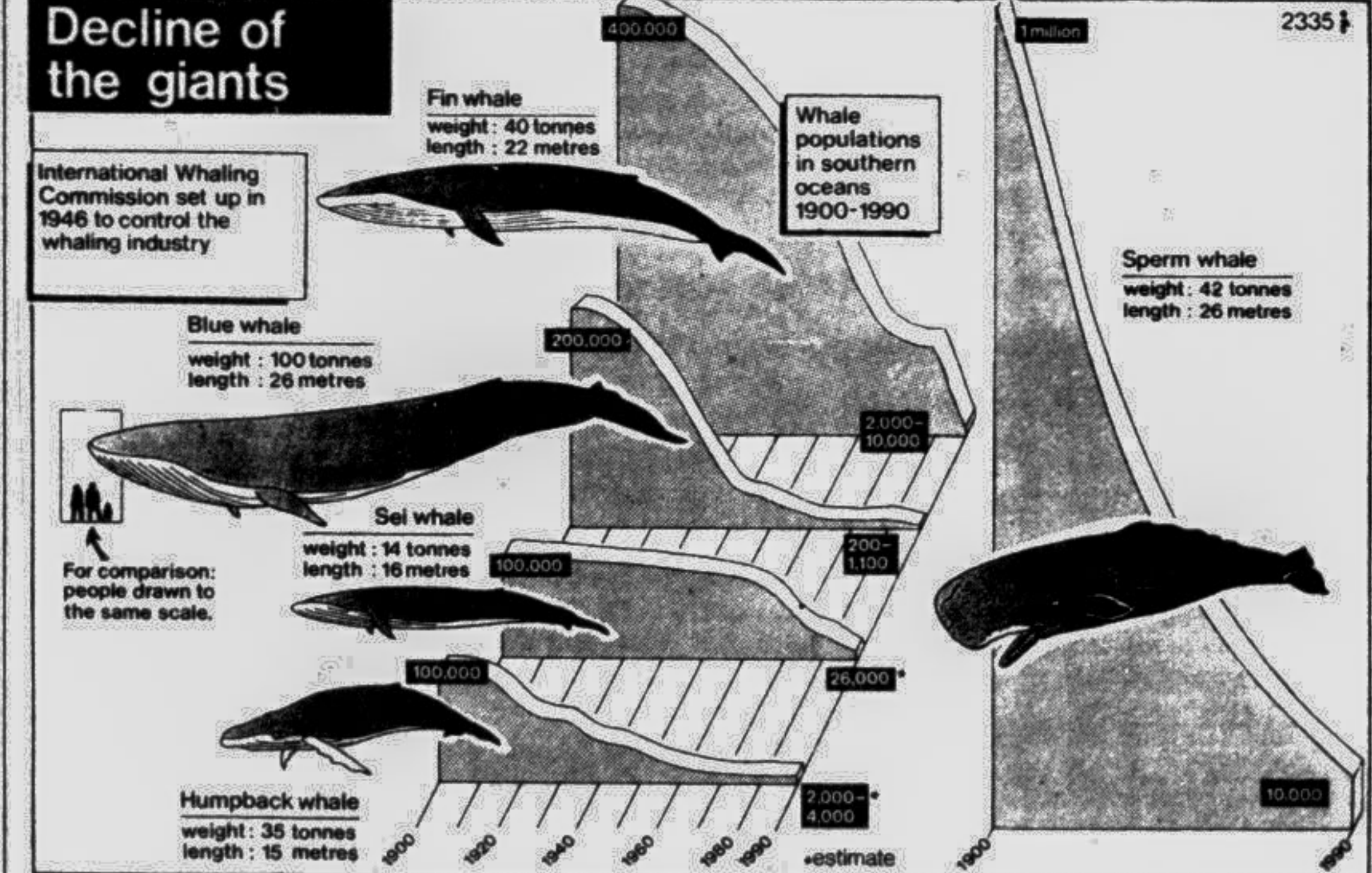
However, a trawler belonging to a whaling company in Chile, caught and killed two

ther into the traditionally US-dominated Latin American market.

Japanese capital is flowing into Chile as never before and this, says Ana Henriquez, public relations officer of the Committee for the Defence of Flora and Fauna, "seems to be far more important than whales, which after all, do not provide much needed hard currency."

being affected not solely by depredatory hunting, but also by marine contamination and the increase in ultraviolet-B radiation, as a result of the thinning of the ozone layer.

Recently evidence shows that plankton production — the base of the Antarctic food chain — is also being affected. Cetaceans (the whale family) emigrate to the southern hemisphere every year to renew their feeding and reproductive cycles, setting up alongside penguins, seals, sea lions, petrel and other species a complex natural interaction that would be dra-



American countries' position at the meeting of the International Whaling Commission (IWC) in Kyoto, Japan.

Brazil and Argentina support the upholding of the moratorium and the creation of the sanctuary. Chile has adopted a rather ambiguous attitude. Jorge Beruho, director for special policies at the Foreign Office, has declared that, "Chile will not support the end of the moratorium unless the rules of the game are clearly defined and some sort of consensus can be reached on the matter." In other words, Chile's final decision depends on others.

Chile has no whaling industry. The CPPS was set up in 1952 to deal with a huge whale hunting problem: More than 300 trawlers, mainly from the northern hemisphere, were devastating stocks.

The International Whaling Commission meeting in Japan has been discussing revision of the seven-year moratorium on whale hunting, and a proposal from France to create a southern ocean whale sanctuary. Member countries — particularly Japan and Norway — have been pressuring the Commission to make changes to the plan, designed to protect the endangered whales. Gemini News Service reports on the economic and political considerations as well as the ecological ones.

Paradoxically, they are not a fundamental source of income for the Japanese economy either. In fact, the whaling industry is quite marginal. Once observer noted: "Japan's opposition to the moratorium and to the sanctuary is nothing but another battle in the war being waged by the power blocs."

Within these parameters Japan, Norway and Iceland have just set up a new whaling organisation for the northern hemisphere that will establish hunting quotas independently from the IWC. This makes France's initiative of creating a whale sanctuary all the more urgent. The French proposal, supported by 17 other countries, calls for the setting up of a circumpolar sanctuary with a northern boundary of 40 degrees south, having the Antarctic continent as its southernmost boundary. It contemplates not the protection of a particular species or stock but of the ecosystem as a whole. This is of great significance, for there is little point in trying to protect depleted whale stocks if the surrounding environment is being destroyed.

Chile and Argentina claim sovereign rights over one million kilometres sq of the white continent's 14 million km sq mass. Under Article VIII of the 1946 Convention, special hunting permits for "scientific purposes" can be granted to a particular nation. Since the moratorium began in 1985, the two main whaling countries, Japan and Norway, have hunted down more than 14,700 whales.

It is an open secret that the overwhelming majority of these have ended up in expensive restaurants rather than in a scientific laboratory. This is the reason, no doubt, behind Japan's petition to increase its "scientific quota" from 330 to over 4,000 whales a year. There used to be over 250,000 blue whales. Now only 800 are left. "So why would the government not support our campaign to save them?" asked a dismayed young student collecting signatures in Santiago. The answer may lie not in ecological considerations, but in economic and political ones.