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### Riwayat Pendidikan:

- **S-1** Fakultas Biologi UGM. 1994.  
Bidang Ilmu: Biologi Lingkungan
- **S-2** Pascasarjana UGM. 2000.  
Bidang Ilmu: Biologi (Bidang Taksonomi Ikan)
- **S-3** Pascasarjana UGM. 2010.  
Bidang Ilmu: Biologi (Bidang Ekologi Ikan)

### *Judul Disertasi*

#### UPSTREAM MIGRATION OF GLASS EEL (*Anguilla spp.*) AT PROGO ESTUARY

#### MIGRASI LARVA SIDAT (*Anguilla spp.*) DI MUARA SUNGAI PROGO

*Leptocephalus* was passively drift on currents from their spawning areas in the Indian ocean to Progo River area. After metamorphosed into glass eel, eels larvae then entered the river. The glass eel entered the river only at a certain time and were influenced by environmental factors. Whereupon, these glass eels migrated further upstream. Srandakan Dam was only 6.5 km from the mouth of Progo River and potentially stops glass eels upstream migration. The interruption of the glass eels upstream migration, caused the sustainability of the eels in the Progo River become endangered. The aims this research to describe the migration of the glass eels which entered the Progo River, and the fate of the glass eels were after their migration which stopped by the dam.

This research was conducted from February 2007 until June 2009. Glass eels collected using the sodo net from at mouth of Progo River on the lunar date 16<sup>th</sup> and 28<sup>th</sup>. The glass eels were collected at 18.00, 20.00, 22.00, 24.00, 02.00, 04.00, and 06.00. Data were collected includes density, age, body size, time of arrival, and swimming speed. Physico-chemical parameters were collected included rainfall, light intensity, salinity, temperature, pH, dissolved oxygen, turbidity, light penetration, river flow velocity, wide

Migrasi *leptocephalus* dari lokasi pemijahan di Samudera Hindia hingga kawasan perairan muara Sungai Progo berlangsung secara pasif mengikuti arus laut. Setelah bermetamorfosis menjadi *glass eel*, selanjutnya larva sidat rase *glass eel* tersebut masuk ke sungai. Larva sidat masuk ke sungai hanya pada waktu tertentu dan dipengaruhi oleh faktor lingkungan. Larva sidat bermigrasi dari kawasan muara ke arah hulu. Dam Srandakan di Sungai Progo yang hanya berjarak 6,5 km dari muara, berpotensi menghentikan migrasi larva sidat. Akibatnya, kelestarian sidat di Sungai Progo menjadi terancam. Penelitian ini bertujuan untuk mempelajari migrasi larva sidat di Sungai Progo, serta nasib sidat setelah migrasinya terhenti oleh Dam Srandakan.

Penelitian dilakukan dari bulan Februari 2007 hingga Juni 2009. Larva sidat rase *glass eel* dikoleksi di kawasan muara menggunakan jaring sodo pada tanggal 16 dan 28 kalender lunar. Waktu sampling pukul 18.00, 20.00, 22.00, 24.00, 02.00, 04.00, dan 06.00. Data yang dikoleksi meliputi kemplimpahan, umur, ukuran tubuh, waktu kedatangan, dan kecepatan renang. Parameter fisiko-kimia yang dikoleksi meliputi curah hujan, intensitas

mouth of the river, water level, and organic materials. These glass eels were tested on the swimming speed and the resilience of life in many different salinities. These glass eels also were collected from the mouth of the river up to Srandakan Dam on the lunar date 17<sup>th</sup> and 29<sup>th</sup>. Yellow eels that collected from the mouth of Progo river until the dam and also at the Nepi tributary using the bubu traps. Glass eel data that collected included body length, climbing ability of eel ladder, and the number of individual. Yellow eels that collected from the dam until headwaters within 62 km from the estuary were collected using fishing rods. Data analyzed for described to glass eel density, and the fate of glass eel after their migration were stopped by the dam. Fluctuations of glass eel density analyzed based on the trend. Percentage of yellow eels were migrated into Nepi tributary analyzed by the CPUE method. The relationship between age and body size of glass eels were analyzed by simple one way ANOVA method. The relationship between physico-chemical parameters and glass eels density in the estuary were analyzed by the PCA method.

In the period of February 2007 - June 2009, the glass eels was collected in mouth of the Progo River of 1.082 samples, consisting of *A. marmorata* (31.42%), *A. bicolor bicolor* (63.96%), and *A. nebulosa nebulosa* (4.62%). These glass eels ages between 58-190 days, which were divided into 5 ages groups. These eels larvae entered the Progo River when sea currents in the Indian Ocean that leading to the Progo River carried leptocephalus. The glass eels migrated into the Progo River only in the rainy season in the month of October to June in the year 2007 to 2009. In the migration period October to January in 2007-2009, these glass eels entered the river from the east, and which the result of spawning in July to October in 2006-2008. In the migration period February to June in 2007-2009 which glass eels entered the river from the west, and which as the result of spawning in November to January in 2006-2009. The glass eel migrated only in the month with rainfall above 125 mm per month, at the end of the lunar month, and at night when the light intensity of 0 lux. The peak annual migration of glass eels in the mouth of the river were occurred at the after preceded by high rainfall 3-5 months earlier and the river flow velocity was low. In these conditions, peak of daily migration were occurred at flood

cahaya, salinitas, suhu, pH, kandungan oksigen terlarut, turbiditas, penetrasi cahaya, kecepatan arus sungai, lebar mulut sungai, aras permukaan perairan muara, dan kandungan bahan organik. Larva sidat yang ditangkap diukur kecepatan renang dan diuji ketahanan hidupnya pada berbagai salinitas yang berbeda. *Glass eel* juga dikoleksi di sungai dari muara hingga dam pada tanggal 17 dan 29 kalender lunar pada pukul 04.00. Sidat rase *yellow eel* di bawah dam ditangkap menggunakan perangkap bubu dari muara hingga dam serta di Kali Nepi. Data *yellow eel* di bawah dam yang dikoleksi adalah cacah individu, panjang tubuh, dan kemampuan memanjat *eel ladder*. Sidat rase *yellow eel* di atas dam ditangkap menggunakan pancing sampai jarak 62 km dari muara. Data dianalisis untuk mendeskripsikan dinamika kelimpahan larva sidat, serta nasib sidat setelah Dam Srandakan dibangun. Dinamika kelimpahan larva sidat dianalisis berdasarkan *trend* yang terjadi. Cacah individu *yellow eel* di bawah dam yang masuk ke Kali Nepi dianalisis dengan metode CPUE. Hubungan antara umur dan ukuran tubuh larva sidat dianalisis dengan metode *one way anova* sederhana. Hubungan antara parameter fisiko-kimia dengan kelimpahan larva sidat di muara dianalisis dengan metode PCA.

Dalam kurun waktu Februari 2007 - Juni 2009 telah dikoleksi sampel larva sidat di muara Sungai Progo sebanyak 1.082 ekor, yang terdiri ares *A. marmorata*, *A. bicolor bicolor*, dan *A. nebulosa nebulosa*. Larva sidat jenis *A. bicolor bicolor* paling banyak masuk sungai (63,96%). Kisaran umur larva sidat 58-190 hari, yang dibagi dalam 5 kelompok umur. Larva sidat masuk ke muara Sungai Progo saat arus laut di Samudera Hindia yang mengarah ke muara membawa *leptocephalus*. *Glass eel* bermigrasi masuk ke Sungai Progo hanya pada musim penghujan di bulan Oktober - Juni pada tahun 2007 - 2009. Pada periode migrasi bulan Oktober - Januari tahun 2007 - 2009 larva sidat datang ke muara dari arah timur, dan merupakan hasil pemijahan bulan Juli - Oktober tahun 2006 - 2008. Pada periode migrasi bulan Februari - Juni tahun 2007 - 2009 larva sidat datang ke muara dari arah barat, dan merupakan hasil pemijahan bulan Nopember - Januari tahun 2006 - 2009. Migrasi tahunan larva sidat

tide. The glass eels were entered the mouth of Progo River immediately upstream migration and can reach Srandakan Dam within 4 days. Upstream migration of the glass eels to headwaters were interrupted by high dam and too near the mouth of river. Most of eels that trapped by the dam could not continued upstream migration. A small percentage of eels that trapped by the dam migrated into the Nepi tributaries.

The conclusion of this study were: the species of eels which migrated to the Progo River were *A. marmorata*, *A. bicolor bicolor*, and *A. nebulosa nebulosa*. The eels of *A. bicolor bicolor* and *A. marmorata* come into the estuaries from the west and the east. *A. nebulosa nebulosa* come into the estuaries from the west. Annual migration occurred during the low salinity because the much water river into the sea a lot in the rainy season. The peak of annual migration preceded by high rainfall 3-5 months earlier and the velocity of the river flow at the mouth of the river was low. Daily migration occurred at the end of the lunar month in the evening when the light intensity of 0 lux. Peak daily migration occurred during the flood tide. The water breaker inhibit the upstream migration of eels in the mouth of the river, and Srandakan Dam was stopped the eels upstream migration.

**Keywords:** migration, eels, *Anguilla*, Progo River, Indian Ocean

berlangsung pada saat curah hujan di atas 125 mm per bulan. Puncak migrasi tahunan larva sidat ke muara sungai terjadi setelah didahului curah hujan yang tinggi 3-5 bulan sebelumnya, dan kecepatan arus di mulut sungai rendah yaitu kurang dari 0,2 m per detik. Migrasi harian larva sidat berlangsung di akhir bulan lunar, pada malam hari saat intensitas cahaya 0 lux. Puncak migrasi harian berlangsung saat air pasang naik. Larva sidat yang masuk muara Sungai Progo segera bermigrasi ke arah hulu dan dapat mencapai Dam Srandakan dalam waktu 4 hari. Migrasi larva sidat rase *glass eel* hanya sampai dam. Dam yang tinggi dan dekat muara sungai menghentikan migrasi sidat. Sebagian besar sidat yang terjebak oleh dam tidak bisa melanjutkan migrasi ke arah hulu. Sebagian kecil sidat yang migrasinya terhenti oleh dam, bermigrasi masuk ke Kali Nepi.

Kesimpulan penelitian ini adalah: jenis sidat yang masuk Sungai Progo adalah *A. marmorata*, *A. bicolor bicolor*, dan *A. nebulosa nebulosa*. Sidat jenis *A. bicolor bicolor* dan *A. marmorata* datang ke muara dari arah barat datang dan timur. Sidat *A. nebulosa nebulosa* datang ke muara dari arah barat. Migrasi tahunan berlangsung saat salinitas rendah akibat air sungai banyak masuk ke laut pada musim penghujan. Puncak migrasi tahunan berlangsung setelah didahului curah hujan yang tinggi 3-5 bulan sebelumnya serta kecepatan arus sungai di mulut sungai rendah. Migrasi harian berlangsung di akhir bulan lunar pada malam hari saat intensitas cahaya 0 lux. Puncak migrasi harian berlangsung saat air laut pasang naik. Tanggul pemecah ombak menghambat migrasi sidat masuk ke muara dan Dam Srandakan menghentikan migrasi sidat.

**Kata kunci:** migrasi, sidat, *Anguilla*, Sungai Progo, Samudera Hindia